			1. CONTRACT ID	CODE PAGE OF PAGES
AMENDMENT OF SOLICITATION/	MODIFICATION	OF CONTRACT	J	1 of 3
2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCH	_	5. PROJECT NO. (If applicable)
2	18-Jul-2003	W58XUW	V-2301-9390	
6. ISSUED BY CODE		7. ADMINISTERED BY	(If other than item 6)	CODE
US Army Corps of Engineers, Kans 760 Federal Building, 601 East Kansas City, Missouri 6410	12th Street			
8. NAME AND ADDRESS OF CONTRACTOR	(No.,street, county, State a	nd ZIP Code)	(x) 9a. AMENDMENT OF	SOLICITATION NO.
			X DACA41-03-R-00	
				SEE ITEM 11)
				SLL II LIWI I I)
			3/7/2003	OF CONTRACTIONNED NO
			10A. MODIFICATION	OF CONTRACT/ORDER NO.
			10B. DATED (S	SEE ITEM 13)
CODE FACILITY CODE  11 THIS I	ITEM ONLY APPLIES T	O AMENDMENTS OF S	OLICITATIONS	
The above number solicitation is amended as set fo				is extended, X is not ex-
tended.	itti iii iteiii 14. Tile iloui a	ind date specified for rece	ipt of Offers	is exterided, A is not ex-
Offers must acknowledge receipt of this amendment prio  (a) By completing Items 8 and 15, and returning  submitted; or (c) By separate letter or telegraph which in  MENT TO BE RECEIVED AT THE PLACE DESIGNATE  REJECTION OF YOUR OFFER. If by virtue of this amendment prior  letter, provided each telegram or letter makes reference	copies of the amendment cludes a reference to the s D FOR THE RECEIPT Of endment you desire to cha	t; (b) By acknowledging re solicitation and amendmen FOFFERS PRIOR TO TH ange an offer already subr	ceipt of this amendment or nt numbers. FAILURE OF IE HOUR AND DATE SPE mitted, such change may b	n each copy of the offer YOUR ACKNOWLEDG- CIFIED MAY RESULT IN be made by telegram or
12. ACCOUNTING AND APPROPRIATION DATA	(If required)			
			OF CONTRACTS/OF DESCRIBED IN ITE	,
(X) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: TRACT ORDER NO. IN ITEM 10A.	(Specify authority)	THE CHANGES SET FOR	TH IN ITEM 14 ARE MADE	IN THE CON-
B. THE ABOVE NUMBER CONTRACT/ORDER IS MOD	DIFIED TO REFLECT THE A 14, PURSUANT TO THE AU		S (S	such as changes in paying office,
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED	INTO PURSUANT TO AUT	HORITY OF:		
D. OTHER (Specify type of modification and authoria	ty)			
E. IMPORTANT: Contractor is not,		s document and return		opies to the issuing office.
14. DESCRIPTION OF AMENDMENT/MODIFICATION	, ,	•	olicitation/contract subject ma	atter where feasible.)
This Solicitation is amended in acc local time, 29 August 2003, in	mily Housing, Wheordance with the Rm 760 Federa	attached pages.	Offers will be re	ceived until 1:00 p.m., MO 64106-2896.
A pre-proposal conference will be h Air Force Base. Offerors m	held at 9:00 a.m ay contact J. Rud	, 31 Julv 2003, in dy at 660-563-23	the Area Engine 11 to arrange acc	er Office of Whiteman cess to the site.
Except as provided herein, all terms and conditions of the	e document referenced in	Item 9A or 10A, as hereto	ofore changed, remains und	changed and in full force
and effect.  15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE O	F CONTRACTING OFFICER	R (Type or print)
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF	AMERICA	16C. DATE SIGNED
		BY		
(Signature of person authorized to sign)			re of Contracting Officer)	
NSN 7540-01-152-8070	30-105		s	TANDARD FORM 30 (REV.10-83)

NSN 7540-01-152-8070 PREVIOUS EDITION UNUSABLE STANDARD FORM 30 (REV.10-83) Prescribed by GSA

# DEPARTMENT OF THE ARMY Kansas City District, Corps of Engineers 757 Federal Building Kansas City, Missouri 64106

## SPECIFICATIONS FOR CONSTRUCTION OF REPLACE FAMILY HOUSING WHITEMAN AIR FORCE BASE, MISSOURI

#### TABLE OF CONTENTS

SF 30 Amendment of Solicitation

List of Changes

Table of Contents

Changed Contract Document Pages

Section 00810 Wage Determinations

#### Division 1 - General Requirements

Section 01000	Scope of Work						
Part 1:	Design and Construction Objectives						
Part 2:	Criteria References						
Part 3:							
Part 4:	Site Planning						
Part 5:	Soils and Subsurface Conditions						
Part 6:	Grading, Paving, and Erosion Control						
Part 7:	Landscape						
Part 8:	Site Utilities						
Part 9:	Housing Unit Design/Construction						
Part 10:	Housing Unit Structural Design						
	Housing Unit Plumbing						
	Major Appliances						
Part 13:	Housing Unit HVAC						
Part 14:	Housing Unit Electrical						
Section 01100	General						
Section 01312A	Quality Control System (QCS)						
Section 01320A	Project Schedule						
Section 01330	Submittal Procedures (for Construction)						
Section 01332	Submittals During Design						
Section 01355A	Environmental Protection						
Section 01451	Section 01451 Contractor Quality Control						
Section 01500A	Temporary Construction Facilities						
Section 01525	Safety and Occupational Health Requirements						
Section 01780A	Closeout Submittals						

### Divisions 2 Through 16 - Technical Requirements

#### Division 2 - Site Work

Section 02220	Demolition
Section 02230	Clearing and Grubbing
Section 02300	Earthwork
Section 02315	Excavation, Filling and Backfilling for Buildings
Section 02316	Excavation, Trenching, and Backfilling for Utilities Systems
Section 02620	Subdrainage System
Section 02700 (Central Plant Ho	Asphaltic Concrete Intermediate Leveling and Surface Courses t Mix)
Section 02712	Lime-Modified Subgrade
Section 02714	Rapid Drainage Layer
Section 02721	Subbase Courses
Section 02722	Graded, Crushed Aggregate Base Course and Rigid Base Course
Section 02748	Bituminous Tack and Prime Coats
Section 02760	Field Molded Sealants for Sealing Joints in Rigid Pavements
Section 02763	Pavement Markings
Section 02770	Concrete Sidewalks, Curbs and Gutters, and Exterior Slabs

#### <u>Division 3 - Concrete</u>

Section 03100	Structural Concrete Formwork
Section 03150	Expansion Joints, Contraction Joints, and Waterstops
Section 03200	Concrete Reinforcement
Section 03300	Cast-in-Place Structural Concrete
Section 03350	Non-Metallic Light-Reflective Surface-Hardened Concrete Floor

#### <u>Division 4 - Masonry thru Division 12 - Furnishings Not Applicable</u>

#### <u>Division 13 - Special Construction</u>

Section	13280	Asbestos	Abatement	
Link to	Appendix	Part 1		
Link to	Appendix	Part 2		
Section	13281	Lead Haza	rd Control	Activities

#### <u>Division 14 - Conveying Systems thru Division 16 - Electrical Not Applicable</u>

### Appendices:

APPENDIX A:	Design Compatibility Standards
APPENDIX B:	Family Housing Community Plan, Volume I
APPENDIX C:	Family Housing Community Plan, Volume II
APPENDIX D:	Landscape Development Plan
APPENDIX E:	2002 Geotechnical Report
APPENDIX F:	2003 Geotechnical Report
APPENDIX G:	2002 Environmental Report
APPENDIX H:	2003 Environmental Report
APPENDIX I:	FEMA In-Residence Shelter Drawings

#### SUMMARY OF CHANGES

#### SECTION 00010 - SOLICITATION CONTRACT FORM

The following have been modified:

#### NOTES:

- Award will be made as a whole to one Contractor on the basis of price and other factors. Offeror's attention is directed to SECTION 00110 PROPOSAL SUBMISSION AND EVALUATION for further details.
- 2. CLIN 0001 The total capacity of this indefinite delivery indefinite quantity (IDIQ) contract is \$135,000,000 over a base period of 5 years and, if exercised, the option for an additional 5 years. It is anticipated that task orders will be awarded annually in the range of \$15 - \$25M, not to exceed \$40M, which will typically include 80-200 units for demolition and replacement and the potential for renovating some existing units. Offeror's attention is directed to SECTION 00700, clauses 52.216-18, 19 and 22.
- Offeror's attention is directed to SECTION 01100: GENERAL for special provisions pertaining to this Solicitation.
- 4. Offeror's attention is directed to SECTION 01100, paragraph titled "Missouri Sales and Use Tax".
- 5. The general outline of the principal features of each item as listed does not in any way limit the responsibility of the offeror for making a thorough investigation of the drawings and specifications to determine the scope of work included in each item.
- 6. Offeror's attention is directed to the CONTRACT CLAUSES wherein the apparent successful offeror is required to submit a small business and small disadvantaged business subcontracting plan. The subcontracting plan shall be submitted in the format that appears at the end of SECTION 00600. Submission of the plan is required prior to award. Award will not be made under this solicitation before the Contracting Officer approves the plan.
- 7. Offeror's attention is directed to the CONTRACT CLAUSES, FAR 52.223-9, Certification and Estimate of Percentage of Recovered Material Content for EPA-Designated Items. Certification will be required upon contract completion unless the Contracting Officer has approved a waiver. The waiver must be approved prior to contract award.
- The Government will procure this contract through a Best value competitive acquisition in accordance with the provisions set forth in the Request for Proposal (RFP).
- Offeror's attention is directed to Section 01100, paragraph 1.12, TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER, which has been modified.
- 10. Specifications included in this Amendment pertain only to Task Order No. 1.

SECTION 00100 - BIDDING SCHEDULE/INSTRUCTIONS TO BIDDERS

The following have been added by full text:

52.214-5000 ARITHMETIC DISCREPANCIES (MAR 1995)

- (a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the bidding schedule as submitted by the bidder:
  - (1) Obviously misplaced decimal points will be corrected;
  - (2) Discrepancy between unit price and extended price, the unit price will govern;
  - (3) Apparent errors in extension of unit prices will be corrected;
  - (4) Apparent errors in addition of lump-sum and extended prices will be corrected.
- (b) For the purpose of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.
- (c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

(End of Statement)

#### 52.217-5 EVALUATION OF OPTIONS (JUL 1990)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option.

#### (End of provision)

SECTION 00700 - CONTRACT CLAUSES

The following have been modified:

#### 52.216-19 ORDER LIMITATIONS. (OCT 1995)

- (a) Minimum order. When the Government requires supplies or services covered by this contract in an amount of less than \$2,000.00, the Government is not obligated to purchase, nor is the Contractor obligated to furnish, those supplies or services under the contract.
- (b) Maximum order. The Contractor is not obligated to honor:
- (1) Any order for a single item in excess of \$40,000,000.00;
- (2) Any order for a combination of items in excess of \$40,000,000.00; or
- (3) A series of orders from the same ordering office within 300 calendar days that together call for quantities exceeding the limitation in subparagraph (1) or (2) above.
- (c) If this is a requirements contract (i.e., includes the Requirements clause at subsection 52.216-21 of the Federal Acquisition Regulation (FAR)), the Government is not required to order a part of any one requirement from the Contractor if that requirement exceeds the maximum-order limitations in paragraph (b) above.
- (d) Notwithstanding paragraphs (b) and (c) above, the Contractor shall honor any order exceeding the maximum order limitations in paragraph (b), unless that order (or orders) is returned to the ordering office within 7 calendar days after issuance, with written notice stating the Contractor's intent not to ship the item

(or items) called for and the reasons. Upon receiving this notice, the Government may acquire the supplies or services from another source.
(End of clause)
(End of Summary of Changes)

## PRICING SCHEDULE (TASK ORDER & OPTIONS)

BASIC ITEMS: PART A SCHEDULE (FY 03 HOUSING UNITS)								
A	B C D E F G							
Item No.	Description	GSF/Unit	No. of Units	Total GSF: Columns C x D	Unit Price: Cost/GSF	Total Amount: Columns E x F		
0001	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan A - FY 03 (See Note 4 below) (Construction Cost Only)			0	\$	\$0		
0002	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan B - FY 03 (See Note 4 below) (Construction Cost Only)			0	\$	\$ <u>0</u>		
0003	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan C - FY 03 (See Note 4 below) (Construction Cost Only)			0	\$	\$ <u>0</u>		
0004	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan D - FY 03 (See Note 4 below) (Construction Cost Only)			0	\$	\$ <u>0</u>		
0005	0005 DESIGN COST FOR ITEMS 0001, 0002, 0003, & 0004 (See Note 4 below) (Must total 92 three bedroom units)							

BASIC ITEMS: PART B SCHEDULE (FY 03 DEMO / SITE / UTILITIES)								
A	В	E						
Item No.	Description	Quantity	Unit Price: Cost/Unit	Total Amount: Columns C x D				
0006	Complete demolition of the 62 FY 03 units (including but not limited to removal of asbestos, lead, chlordane, utilities, foundations, etc., and restoration of the site)  TOTAL ITEM NO. 0006 Demolition Cost:	No. of units: 62	\$	\$ <u>0</u>				
0007	Entire work complete for one of the "minimum" road connections out of the FY03 housing area; including but not limited to grading, drainage, curbs, paving, landscaping, pedestrian walks, and street lighting (Construction Cost Only)	Job	Lump Sum	\$				
0008	Entire work complete for Infrastructure to serve FY03 housing area but in accordance with the Contractor's future Development Plan (excluding Item 0007 above, excluding full "looping" of the site utility / electrical service trunks beyond a single line service to the FY03 housing area, and excluding the second of the two "minimum" road connections out of the FY03 housing area); including but not limited to all common areas and housing lots for electrical distribution, sanitary sewer, gas and water service; grading; pedestrian walks; playgrounds; landscaping; streets and street lighting							
	(Construction Cost Only)	Job	Lump Sum	\$				
0009	DESIGN COST FOR ITEMS 0006, 0007, & 0008			\$				

	TOTAL BASIC AMOUNT: (PART A + B, FY 03)					
0010	TOTAL CONSTRUCTION COST (ITEMS 0001 + 0002 + 0003 + 0004 + 0006 + 0007 + 0008)	\$	0			
0011	TOTAL DESIGN COST (ITEMS 0005 + 0009)	\$	0			
0012	TOTAL BASIC AMOUNT (ITEMS 0011 + 0012)	\$	0			

OPTION 1 ITEMS: PART A SCHEDULE (FY 04 HOUSING UNITS)							
A	В	С	D	E	F	G	
Item No.	Description	GSF/Unit	No. of Units	Total GSF: Columns C x D	Unit Price: Cost/GSF	Total Amount: Columns E x F	
0013	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan A - FY 04 (See Note 4 below)						
	(Construction Cost Only)			0	\$	\$0	
0014	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan B - FY 04 (See Note 4 below)						
	(Construction Cost Only)			0	\$	\$0	
0015	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan C - FY 04 (See Note 4 below)						
	(Construction Cost Only)			0	\$	\$0	
0016	All work complete - including all betterments proposed - for # of Three Bedroom Housing Units of Floor Plan D - FY 04 (See Note 4 below)						
	(Construction Cost Only)			0	\$	\$0	
0017	All work complete - including all betterments proposed - for # of Four Bedroom Housing Units of Floor Plan E - FY 04 (See Note 4 below)						
	(Construction Cost Only)			0	\$	\$0	
0018	All work complete - including all betterments proposed - for # of Four Bedroom Housing Units of Floor Plan F - FY 04 (See Note 4 below)						
	(Construction Cost Only)			0	\$	\$0	

0019	All work complete - including all			
	betterments proposed - for # of			
	Four Bedroom Housing Units of			
	Floor Plan G - FY 04			
	(See Note 4 below)			
	(Construction Cost Only)	 	0	\$ \$0
	DESIGN COST FOR ITEMS 0014, 0015, 00 (Must total 90 three bedroom units and 10 f		elow)	\$

OPTION 1: PART B SCHEDULE (FY 04 DEMO / SITE / UTILITIES)						
A	В	C	D	E		
Item No.	Description	Quantity	Unit Price: Cost/Unit	Total Amount: Columns C x D		
0021	Complete demolition of the 100 FY 04 units (including but not limited to removal of asbestos, lead, utilities, foundations, etc., and restoration of the site)	N 6 4				
	TOTAL ITEM NO. 0022 Demolition Cost:	No. of units: 100	\$	\$0		
0022	Entire work complete for the second of the two "minimum" road connections out of the FY03 housing area; including but not limited to grading, drainage, curbs, paving, landscaping, pedestrian walks, and street lighting					
	(Construction Cost Only)	Job	Lump Sum	\$		
0023	Entire work complete for full "looping" of the site utilities (electrical) service for the entire FY03 and FY04 housing areas (beyond a single line service to the FY03 housing area), including remaining connections to Base (electrical) service					
	(Construction Cost Only)	Job	Lump Sum	\$		
0024	Entire work complete for new perimeter access control fence connecting to existing perimeter control fence at each end					
	(Construction Cost Only)	Job	Lump Sum	\$		
0025	Entire work complete for Infrastructure to serve FY04 housing area but in accordance with the Contractor's future Development Plan (excluding Basic FY 03 items and Items 0023 and 0024 above); including but not limited to all common area and lots for electrical distribution, sanitary sewer, gas and water service; grading; pedestrian walks; playgrounds; landscaping; streets and street lighting					
	(Construction Cost Only)	Job	Lump Sum	\$		
0026	DESIGN COST FOR ITEMS 0021, 0022, 0023, 0024, & 0025			\$		

	TOTAL OPTION 1 AMOUNT: (PART A + B, FY 04)		
0027	TOTAL OPTION 1 CONSTRUCTION COST (ITEMS 0013 + 0014 + 0015 + 0016 + 0017 + 0018 + 0019 + 0021 + 0022 + 0023 + 0024 + 0025)	\$	0
0028	Discount, primarily for site and utility savings, for concurrent construction (but not concurrent design) of Option 1 (FY 04) with Basic Items (FY 03)		
	TOTAL OPTION 1 CONSTRUCTION COST DISCOUNT	( \$	)
0029	TOTAL OPTION 1 DESIGN COST (ITEMS 0020 + 0026)	\$	0
0030	TOTAL OPTION 1 AMOUNT (ITEMS 0027 + 0028 + 0029)	\$	0

TOTAL OPTION 2 (ADDITIONAL DEMO)						
A	В	С	D	E		
Item No.	Description	Quantity	Unit Price: Cost/Unit	Total Amount: (Columns C x D)		
	Complete demolition of the 8 additional units (including but not limited to removal of asbestos, lead, chlordane, utilities, foundations, etc., and restoration of the site)  TOTAL OPTION 2 DEMOLITION COST	No. of units: 8	\$	\$0		
0032	TOTAL OPTION 2 DESIGN COST			\$		
0033	TOTAL OPTION 2 AMOUNT (ITEMS 0031 + 0032)			\$0		

GRAND TOTAL AMOUNT				
0034 GRAND TOTAL AMOUNT (ITEMS 0013 + 0030 + 0033)		\$0		

a)	Contractor proposes th calendar days.	e Basic Items work above will be completed in
b)	Contractor proposes th calendar days.	e Option 1 work above will be completed in
c)	Office Overhead	
d)	Profit	9/0
e)	Bonding	<del></del> 0/ <sub>0</sub>

## Signature of Authorized Company Principal

#### **NOTES:**

- 1. Prices must be entered for all line items on the Pricing Schedule. Grand total amount price submitted (Line #) without prices for individual line items will not be evaluated. The Contractor's addition will be subject to verification by the Government. In case of variation between an individual item price and the grand total amount, the individual item price will be consider in the price. The terms "Construction Cost" and Design Cost," noted above, include everything required to complete the work, including associated profits and fees.
- 2. A modification to the Pricing Schedule, which provides for a single adjustment to the grand total amount, will not be accepted. Modification to Pricing Schedule items, basic or options, should state the application of the adjustment to each respective individual items price affects. If the modification is not so apportioned the Pricing Schedule item will not be evaluated.
- 3. The completion time and percentage blanks listed in a) through e) shall be filled in by the Offeror. Items c) through e) shall indicate percentages used in pricing items for this Task Order. It is the Government's intention to use the prices given within the Pricing Schedule and the percentage indicated above by the "successful" Offeror to negotiate future Task Orders. See Section 00110: PROPOSAL SUBMISSION AND EVALUATION for information on Volume III PRICE.
- 4. Unit Construction and Design prices are in include all work required with 5 feet outside the building lines. To clarify, include all driveways, patios, and privacy screens (between adjoining duplex units) to be "within 5 feet," but do not include the backyard fencing "within the 5 feet."
- 5. Types of housing units may or may not vary from fiscal year to fiscal year. For instance, "Type A FY 03" units may or may not be identical in size, layout, or appearance to "Type A FY 04" units.
- 6. It is the intent of the Government to award a contract that meets or exceeds the requirements of this solicitation while also meeting funding limitations.

FUNDING LIMITATION FOR BASIC ITEMS (FY 03) \$15,750,000. FUNDING LIMITATIONFOR OPTION 1 (FY 04) \$17,150,000.

7. Determination of the Offeror's total price for the proposed work will be based on the TOTAL of the BASE SCHEDULE and OPTION SCHEDULE. Immediate award will be made of the BASE SCHEDULE. At the option of the Government, the OPTION SCHEDULE may be awarded at the

proposal price after Notice of Award for the BASE SCHEDULE work. The Government does not guarantee any work beyond that of the BASE SCHEDULE. The Government reserves the right to pick up the OPTION SCHEDULE at the proposal price within 180 calendar days after the Notice to Proceed. Offeror's attention is directed to SECTION 00100 for further option details.

### **BETTERMENTS BREAKOUT**

	All betterment	<b>BETTER</b> s proposed shall be <u>inc</u>		BREAKOUT rices offered in the Pr		<b>:</b>	
A	В	С	D	E	F	G	Н
		Include	d for Basic Item	ns (FY 03)	Includ	ed for Option 1	(FY 04)
Item No.	Description	Unit Price: Cost/Unit	No. of Units (92 total)	Total Amount: Columns C x D	Unit Price: Cost/Unit	No. of Units (100 total)	Total Amount: Columns F x G
	RIORITY GROUPING	1		1		1	T
0001	Plastic laminate floor in front entry, living, dining, family (in all units provided)	\$	92	\$0	\$	100	\$0
SECONI	PRIORITY GROUPING		<u> </u>	<u> </u>	<u> </u>		
0002	Ceiling heights 9' or greater					I	
0002	(in more than 50% of units provided)	\$		\$0	\$		\$0
0003	Dual access to mech. rooms (in more than 50% of units provided)	\$		\$0	\$		\$0
0004	Patterned colored concrete, front stoops/patios (at all units provided)	\$	92	\$0	\$	100	\$0
THIRD I	PRIORITY GROUPING					L	
0005	Zoned HVAC for all two-story units	\$		\$0	\$		\$0
0006	Masonry at least 50% building exterior (in at least 33% of units provided)	\$		\$0	\$		\$0
0007	Garage personnel door and connecting sidewalk (in all units provided)	\$	92	\$0	\$	100	\$0
0008	Master Bedroom closets increased 25% (in all units provided)	\$	92	\$0	\$	100	\$0
0009	Solid surfacing kitchen counters, integral sink (in all units provided)	\$	92	\$0	\$	100	\$0
0010	Laundry sink in a base cabinet (in more than 50% of units provided)	\$		\$0	\$		\$0
0011	Walks on both sides of streets (fronting all units provided)	\$	92	\$0	\$	100	\$0
0012	Garage doors 20' behind front of building (in at least 33% of units provided)	\$		\$0	\$		\$0
0013	Garage door openers installed (in all units provided)	\$	92	\$0	\$	100	\$0
0014	Paint interior walls of garage (in all units provided)	\$	92	\$0	\$	100	\$0
ANY BE	TTERMENTS PROPOSED BY CONTRA	ACTOR	•	•		•	
0015	(Describe)						
		\$		\$0	\$		\$0

A	В	C	D	E	F	G	Н
		Included	for Basic Item	s (FY 03)	Include	d for Option 1	(FY 04)
Item No.	Description	Unit Price:	No. of	Total Amount:	Unit Price:	No. of	Total Amount:
		Cost/Unit	Units	Columns C x D	Cost/Unit	Units	Columns F x G
			(92 total)			(100 total)	
ADDITIO	ONAL BETTERMENTS PROPOSED BY O	CONTRACTOR					
0016	(Describe)						
		\$		\$ 0	\$		\$ 0
0017	(Describe)						
		\$		\$ 0	\$		\$ 0

#### NOTES:

- 1. All Betterments proposed shall be *included* in the prices in the Pricing Schedule above.
- 2. Prices on this Breakout sheet must reflect only the difference in cost between the Betterment and the criteria contained in this RFP.
- 3. Prices must be entered for all line items that the Offeror intends to provide.
- 4. Refer to Section 00110 PROPOSAL SUBMISSION AND EVALUATION paragraphs 5.2.1 and 5.2.3 for additional submittal requirements regarding betterments

#### 5.2.1 TAB 7 HOUSING UNIT CONCEPT DESIGN - SUBMITTAL REQUIREMENTS

Tab 7 HOUSING UNIT CONCEPT DESIGN consists of two subfactors: Housing Unit Design and Supporting Data Housing Unit Design.

#### a) HOUSING UNIT DESIGN

(1) Architectural Design Narrative. Provide a description of how the desired architectural character is achieved through the use of form, scale and proportion, and how materials are used to add pattern and definition to the design. Discuss the sensory perception and recognition of the physical elements as they are experienced sequentially in time as one approaches, enters and moves through the order of spaces within the housing unit. Briefly discuss the functioning of activities within the housing unit spaces and the qualities of light, view and acoustics.

#### (2) Architectural Design Drawings.

- (i.) Architectural Floor Plans Provide overall dimensions, room dimensions and areas, equipment and fixtures, include door swings and typical furniture arrangements, identify types of materials and show all columns, partitions, openings, and roof overhangs.
- (ii.) Exterior Elevations Provide drawings to present design intent, identity exterior materials and show proposed detailing. Indicate door and windows sizes and configurations, porches, decks and exterior steps. Provide major horizontal and vertical dimensions.
- (iii.) Building Section Provide a building section of the Offeror's choice that will illustrate the vertical relationship of all major building components, walls, floors, ceiling and roofs. Identity materials and show foundations, porches and decks as applicable. Explain how this section is either typical of all proposed family housing units or how other models may be different from the section shown.
- (iv.) Wall Section Provide a typical wall section showing foundation, wall composition, and floor and roof system. Identify materials, finishes, thermal insulation and vapor protection.
- (v.) Finish and Equipment Schedules Provide interior finish schedule, door and window schedule. Include ceiling heights on the interior finish schedule.
- (vi.) Mechanical Room Provide layout of equipment as proposed for the mechanical room.
- (vii.) See Section 01000, Parts 3, 4, 9, 10, 11, 12, 13, and 14 for further clarification of items to be provided with the Offeror's submittal.
- (viii.) Use the Area Calculation Worksheet, attached to this Section, in your Offer to support compliance with RFP criteria. (May be edited as a Microsoft WORD file, location is on CD-ROM in folder "Guides," file name is "supporting data.doc." Edit and print as many as needed for completion of TAB 7a Housing Unit Design.)
- (3) Color Boards. Color boards are to depict exterior and interior materials, finishes, and colors. Color board submittal is to be bound in a standard, letter-size binder.

#### b) SUPPORTING DATA HOUSING UNIT DESIGN

Product Literature. The Offeror shall fill out and submit the attached form titled, "Construction Materials, Product, Equipment, and Systems," to indicate key elements of the proposed materials, products, equipment, and systems that the Offeror intends to use as the starting-point for the Offeror's design. [May be edited as a Microsoft WORD file, location is on CD-ROM in folder "Guides," file name is "stdform.doc." Edit and print as many as needed for completion of TAB 7a Housing Unit Design.] If the represented manufacturer, grade, type, thickness, finish, warranty period, model number, or any other information provided does not exactly match the specific requirements contained in this solicitation, the Offeror shall nevertheless be obligated to design, furnish, and install items which do meet all criteria. In addition, the Offeror shall provide product literature for proposed lighting fixtures and appliances as listed in this attached form including manufacturer's descriptive literature, technical data, performance charts and curves, catalog cuts, etc.

- (1) Betterments. The Offeror shall complete the Betterments Breakout included with the Pricing Schedule as part of the requirements for Volume III PRICE. As a part of the requirements of Volume II Tab 7 SUPPORTING DATA HOUSING UNIT DESIGN, the Offeror shall list on a separate letter-size form of the Offeror's choosing these same Betterments proposed by the Offeror. Include descriptive information on the materials, products, equipment, systems, etc. proposed in the Betterment. Indicate as well to what percentage of the housing units any Betterment applies. See Section 01000, Part 1 for list and priority of qualified Betterments.
- (2) Deviations. The Offeror shall provide a list of all deviations that are deemed necessary by the Offeror to achieve cost limitations or meet statutory requirements, and/or are mandatory due to technical flaws in the solicitation (i.e. performance, structural integrity, safety, maintainability, applicable code requirements, etc.) in order to deliver the intended basic requirements of the solicitation. Each deviation shall include an explanation of why the Offeror believes the deviation is necessary. This list shall be on a letter-size form of the Offeror's choosing.
- (3) Recovered Materials and Sustainable Design. See Section 01000, Part 3 for list of items to be submitted with the Offer regarding recovered materials and all sustainability items.

#### 5.2.2 TAB 7 HOUSING UNIT CONCEPT DESIGN - EVALUATION

Tab 7 HOUSING UNIT CONCEPT DESIGN contains two subfactors that are listed in descending order of importance: Housing Unit Design and Supporting Data Housing Unit Design. Tab 7 HOUSING UNIT CONCEPT DESIGN will be evaluated as follows:

#### a) HOUSING UNIT DESIGN

- (1) Exterior Architectural Design. This part of the evaluation assesses the degree to which the proposed buildings provide the desired architectural appearance. Consideration will be given to the use of form, scale and proportion, and materials to order relationships among the building's elements to achieve the desired character and individuality. Also, consideration will be given to how the detailing of materials complements the design and adds to the visual interest and appeal of the building.
- (2) Interior Architectural Design. This part of the evaluation assesses the elements of planning and designing the family housing unit interiors. Consideration will be given to the livability, flexibility, functionality, and individuality of the floor plans. Also, consideration will be given to the overall sensory perception of the physical elements of the design including qualities of light, view and acoustics.
- (3) Areas. This part of the evaluation assesses the Offeror's preparation of the Area Calculation Worksheets for compliance with solicitation requirements.

#### b) SUPPORTING DATA HOUSING UNIT DESIGN

- (1) Housing Unit Exterior Materials. This part of the evaluation assesses the housing unit exterior construction materials and finishes.
- (2) Housing Unit Interior Materials. This part of the evaluation assesses the housing unit interior construction materials and finishes.
- (3) Housing Unit Mechanical Systems. This part of the evaluation assesses the housing unit mechanical systems including heating and air-conditioning, plumbing and ventilation.
- (4) Housing Unit Electrical Systems. This part of the evaluation assesses the housing unit electrical systems including power, lighting and communications.
  - (5) Appliances. This part of the evaluation assesses the quality of all major appliances.
- (6) Recovered Materials and Sustainable Design. Consideration will be given to the extent that the Offer addresses the criteria for sustainable design and construction. See Section 01000, Part 3.
- (7) Betterments. The Offeror will be evaluated on the priority and number of Betterments proposed. The Government believes the solicitation requirements are technically sound, comply with all statutory requirements, and are awardable with the specified cost limitation. Higher evaluations will be assigned based on the number and priority of Betterments proposed. See above paragraph 5.2.1, b) (2) on conditions and use of Betterments.
- (8) Deviations. Deviations that, in the Government's evaluation, negatively conflict with the solicitation requirements may be evaluated unfavorably or even result in rejection of the Offer as non-responsive.

#### 5.2.3 TAB 8 SITE CONCEPT DESIGN - SUBMITTAL REQUIREMENTS

Tab 8 SITE CONCEPT DESIGN consists of three subfactors: Site Concept Design, Demolition Plan, and Supporting Data Site Design.

#### a) SITE CONCEPTDESIGN

- (1) Site Analysis Narrative. Provide a description of the basic site layout and the rationale behind the site design. Address how the Offer accomplishes the objectives, goals, and standards listed in Section 01000, Part 4. This should be a comprehensive look at the new housing neighborhood including the follow-on phases of development. Also address environmental conditions, prevailing winds, solar effect, and the relationship of the site to the surrounding areas.
- (2) Site Concept Presentation Plan. See Section 01000, Parts 4, 6, 7, and 8 for detailed clarification of items to be provided. Provide practical and sound site layouts drawn to scale based on the topographical information available from existing records provided by the Government and the known subsurface soil conditions. Among the items that shall be included are the proposed location of point of connection to existing utilities, location of utility corridors and location of connection points for extension of utilities into the follow-on phases of development, proposed storm drainage layout, roads, sidewalks, and landscape design including recreation/common areas, etc. Indicate finish floor elevations and approximate site finish contours. The proposed site development for the follow-on phases of the work is to be

conceptual in nature showing how the proposed roads, utility corridors, and recreation/common areas will serve the total new housing neighborhood development.

#### b) DEMOLITION PLAN

The Offeror shall submit a comprehensive Demolition Plan that provides detailed information on the extent of demolition requirements and procedures used to accomplish all demolition identified in the basic Task Order. The demolition plan shall include information such as: (1) Description of the demolition procedures proposed, (2) Permits required, (3) Hazardous material (Asbestos, Lead Base Paint, and Chlordane) removal methods and procedures, (4) Safety precautions to be taken, and (5) Equipment proposed to be used for demolition.

#### c) SUPPORTING DATA SITE DESIGN

Product Literature. The Offeror shall fill out and submit the attached form titled, "Construction Materials, Product, Equipment, and Systems," to indicate key elements of the proposed materials, products, equipment, and systems that the Offeror intends to use as the starting-point for the Offeror's design. (May be edited as a Microsoft WORD file, location is on CD-ROM in folder "Guides," file name is "stdform.doc." Edit and print as many as needed for completion of TAB 7a Housing Unit Design.) If the represented manufacturer, grade, type, thickness, finish, warranty period, model number, or any other information provided does not exactly match the specific requirements contained in this solicitation, the Offeror shall nevertheless be obligated to design, furnish, and install items which do meet all criteria.

- (1) Betterments. The Offeror shall complete the Betterments Breakout included with the Pricing Schedule as part of the requirements for Volume III PRICE. As a part of the requirements of Volume II Tab 7 SUPPORTING DATA SITE DESIGN, the Offeror shall list on a separate letter-size form of the Offeror's choosing these same Betterments proposed by the Offeror. Include descriptive information on the materials, products, equipment, systems, etc. proposed in the Betterment. Indicate as well to what percentage of the housing units any Betterment applies. See Section 01000, Part 1 for list and priority of qualified Betterments.
- (2) Deviations. The Offeror shall provide a list of all deviations that are deemed necessary by the Offeror to achieve cost limitations or meet statutory requirements, and/or are mandatory due to technical flaws in the solicitation (i.e. performance, structural integrity, safety, maintainability, applicable code requirements, etc.) in order to deliver the intended basic requirements of the solicitation. Each deviation shall include an explanation of why the Offeror believes the deviation is necessary. This list shall be on a letter-size form of the Offeror's choosing.
- (3) Recovered Materials and Sustainable Design. Include information on the use of EPA designated items composed of recovered (recycled) site materials. Indicate specific material and equipment being proposed by highlighting model numbers or specific types and grades of materials on manufacturer's product data / catalog cut-sheets / literature. Recovered Materials should be used in the site work to the maximum extent practicable. Practicable is defined (per 40 CFR CH.1, 247.3) as capable of being used consistent with (a) performance in accordance with applicable specifications, and (b) availability at a reasonable price, availability within a reasonable period of time, and maintenance of a satisfactory level of competition. Provide a list of such materials proposed on this project. Also see Section 01000, Part 3 for list of additional items to be submitted with the Offer regarding recovered materials and all sustainability items.

#### 5.2.4 TAB 8 SITE CONCEPT DESIGN - EVALUATION

Tab 8 SITE CONCEPT DESIGN contains three subfactors that are listed in descending order of importance: Site Design, Demolition Design, and Supporting Data Site Design. Tab 8 SITE CONCEPT DESIGN will be evaluated as follows:

#### a) SITE CONCEPT DESIGN

Overall, the Site Concept Design will be evaluated on how the Offer meets or exceeds the overall objectives, goals, and standards listed in Section 01000, Part 4, as well as the points listed in this paragraph.

- (1) Neighborhood Identity. This part of the evaluation deals with how successfully the proposed family housing site design uses the principal of spatial "hierarchy" to create a sense of neighborhood identification for residents. The evaluation will look at the use of open space, street layout and pedestrian circulation in relationship to individual units, sub-neighborhoods and the neighborhood community. Consideration will be given to the following elements, all with approximately the same order of importance:
- (i.) Street Layout: Vehicle circulation, turning movements at intersections, lighting, visual buffering, and integration of future housing development.
  - (ii.) Pedestrian circulation and accessibility to recreation areas.
- (iii.) Emergency and service vehicle access: Provision for immediate and direct access, and adequate night lighting, for emergency vehicles and access for service vehicles. This includes servicing the utilities located in the utility corridor as well as mail delivery and trash pickup.
- (iv.) Grading: Site development provisions for drainage solutions that retain storm water on site, provide adequate protection for living units and yards, and prevent ponding in common areas.
- (2) Landscaping. Consideration will be given to the following elements, all with approximately the same order of importance.
- (i.) Creation of open spaces for recreation, privacy, set-backs, as well as the use of landscape to define these amenities, and buffers from noisy elements and the integration of these elements into the overall site plan with includes the follow-on phases of development.
- (ii.) All considerations of landscape design, location, size and quantity, and appropriateness of planting selection.
- (3) Utilities: This area of evaluation includes overall planing, layout, design and development of the site utility systems, including the utility corridor. It embraces consideration of flexibility, maintenance, and accessibility. It includes evaluation of the design of the following systems: water distribution system, electrical system including site and street lighting, telephone and cable television, gas distribution system, and sanitary sewage system.

#### b) DEMOLITION PLAN

The Demolition Plan will be evaluated for its inclusion of all tasks identified in the Demolition Plan submittal paragraph above. Higher evaluation ratings can be achieved with a thoroughly explained Demolition Plan suitable for the scope and complexity of this housing project.

#### c) SUPPORTING DATA SITE DESIGN

Consideration will be given to the quality, durability and degree and frequency of maintenance required of the equipment and materials proposed for the project based on the following elements, all with approximately the same order of importance:

- (1) Site Equipment and Materials. This part of the evaluation assesses the quality of the materials and proposed for the project site development including civil, electrical and landscaping.
- (2) Percentage of Recovered Materials Used in Site Work. Consideration will be given to the extent that the designated items are proposed for this project. The more materials offered, the higher the rating assigned.
- (3) Betterments. The Offeror will be evaluated on the priority and number of Betterments proposed. The Government believes the solicitation requirements are technically sound, comply with all statutory requirements, and are awardable with the specified cost limitation. Higher evaluations will be assigned based on the number and priority of Betterments proposed. See above paragraph 5.2.3, c) (2) on conditions and use of Betterments.
- (4) Deviations. Deviations that, in the Government's evaluation, negatively conflict with the solicitation requirements may be evaluated unfavorably or even result in rejection of the Offer as non-responsive.

## AREA CALCULATION WORKSHEET (Page 1 of 1)

PROPOSER		UNIT "NA	AME"			
			GRADE (	ex. E4-E6) _		
			NO. OF B	EDROOMS		
GR	ROSS	FLOOR AREA CALCU	LATIONS:			
1.	OV	ERALL FLOOR AREA	within exterior face of exterior	walls & cente	r line of party walls in duple	ex units):
	a.	Exterior Bulk Storage (e	xcluding space allocated for gar	age and trash	):	
		Dimensions:	X		=	_SF
	b.	Other (excluding Exterio	or Bulk Storage):			
		Dimensions:	X	_	=	_SF
			X		_=	_SF
			X			
	c.	TOTAL OVERALL FLO	OOR AREA =			_SF
2.	EX	CLUDABLE FLOOR AF	EA (if included above):			
	a.	Garages (including space	e allocated for exterior bulk stor	age and trash	, excluding space for walls):	
		Dimensions:	X		_=	_SF
	b.	Porches (open or closed,	not heated or cooled, retaining	the basic char	racteristics of a porch):	
		Dimensions:	X		=	_SF
	c.	Patio / deck / balcony / e	ntrance stoop:			
		Dimensions:	X		=	_SF
	d.	TOTAL EXCLUDABLE	E FLOOR AREA (if included in	Overall calc	) =	_SF
3.	GR	OSS FLOOR AREA (Sul	otract 2.d. from 1.c.)			
		TOTAL GROSS FLOO	R AREA =			_SF
		COMPARISION TO:	(List the Programming BENC	CHMARK: )		_SF
			(List the Programming MAX	IMUM: )		_ SF
			(List the Programming MINI	MUM: )		_SF
		EN CABINET SIZE CAI o Section 01000, Part 9 fo	CULATIONS: or minimum requirements)			
			Pr	ovided	Required Minimum	
Co	untei	rtop *		SF	SF	
	* e	xcludes countertop area ta	ken by sink and range			

#### CONSTRUCTION MATERIALS, PRODUCTS, EQUIPMENT AND SYSTEMS

For **each** listed item of construction materials, products, equipment and systems below, provide information in the same format as described for color boards, and coordinated with the color boards.

The Offeror shall provide information representing the key elements of the material, product, equipment, or systems that the Offeror intends to use as the starting-point for the Offeror's design. If the represented manufacturer, grade, type, thickness, finish, warranty period, model number, or any other information provided does not exactly match the specific requirements contained in this solicitation, the Offeror shall nevertheless be obligated to design, furnish, and install items which do meet all criteria.

Information to be provided on a standard form attached herewith (may be edited as a Microsoft WORD file, location is on CD-ROM in folder "Guides", file name is "stdform.doc". Edit and print as many as needed for completion of TAB 7 c), Supporting Data) that may be edited as appropriate of each category and item listed on the following pages:

(Submit one form for each item listed. The Contractor may generate an equivalent form that utilizes the same format as this standard form.)

- A. Manufacturer, Name/Model/Grade/Type, Size/Thickness/Capacity, Warranty Period, and Description/Use/Location.
- B. A referenced location in the Offer for each item listed.
- C. Identification that the item is or is not a Betterment or a Deviation (see additional requirements below).
- D. For light fixtures and appliances, attach Manufacturer's Product Data Cut-Sheets.

Information to be provided, each as a separate listing on a separate letter-size form of the Offeror's choosing, in addition to the standard form described above:

#### A. Listing of Betterments

The Offeror shall complete the Betterments Breakout included with the Pricing Schedule as part of the requirements for Volume III PRICE. As a part of the requirements of Volume II – Tab 7, the Offeror shall list these same Betterments to the requirements of the solicitation. This includes consideration of the key elements (materials, products, equipment, systems, etc.) addressed in the standard form above and any other items that qualify as Betterments to be designed, furnished, and installed as part of the Offer. Include the percentage of the housing units to which each particular Betterment applies. See Section 01000, Part 1 for list and priority of qualified Betterments.

#### B. Listing of Deviations

Identify and list any item (materials, products, equipment, systems, etc.) that is considered a Deviation to the requirements of the solicitation. List all deviations that are deemed necessary by the Offeror to achieve cost limitations or meet statutory requirements, and/or are mandatory due to technical flaws in the solicitation (i.e. performance, structural integrity, safety, maintainability, applicable code requirements, etc.) in order to deliver the intended basic requirements of the solicitation. Each deviation shall include an explanation of why the Offeror believes the deviation is necessary. The Government believes the solicitation requirements are technically sound, comply with all statutory requirements, and are awardable within the specified cost limitation. Deviations that, in the Government's evaluation, negatively conflict with the solicitation requirements may be evaluated unfavorably or even result in rejection of the Offer as non-responsive.

### CONSTRUCTION MATERIALS, PRODUCTS, EQUIPMENT, AND SYSTEMS

## 1. HOUSING UNIT EXTERIOR MATERIALS AND FINISHES (Or items 1 through 5 as applicable.)

EXTERIOR WALLS (Or appropriate category as applicable)

SIDING / FASCIA / TRIM (Or appropriate item as applicable)

Referenced Location in the Offer	
Manufacturer – Source	
Product Name / Model Number / Grade /	
Type / Classification	
Size – Capacity	
Warranty Period (as applicable)	
Manufacturer's Data Cut-Sheet attached	
(light fixtures & appliances only)	
Description / Use / Location	
Betterment (Yes/No)	
Deviation (Yes/No)	

#### 1. HOUSING UNIT EXTERIOR MATERIALS AND FINISHES

#### **Exterior Walls**

Siding / Fascia / Trim Exterior Masonry Windows / Screens Exterior Colors

#### Roof

Shingles Gutters & Downspouts

#### 2. HOUSING UNIT INTERIOR MATERIALS AND FINISHES

#### Walls, Floors & Finishes

Doors and Hardware (All Areas)\*
Stairs and Railings
Floor Covering (All Rooms)\*
Wall & Ceiling Finish (Paint) – All Rooms\*
Window and Door Trim (All Rooms)\*

\* - A schedule may be provided for these items along with other required data.

#### **Bathroom**

Bathtub and/or Shower Enclosure Vanities, Cabinets & Hardware

#### Kitchen

Cabinets and Hardware Counter Tops

#### 3. SITE EQUIPMENT AND MATERIALS

Fencing

#### 4. HOUSING UNIT MECHANICAL/ELECTRICAL SYSTEMS

Lighting Fixtures Ceiling Fans

#### 5. APPLIANCES

Refrigerator Range Range Hood Dishwasher Garbage Disposer

#### SECTION 00810

#### WAGE RATES

- 1. MOO30001, dated 06/13/2003, no mods.
- 2. MO030037, dated 06/13/2003, no mods.

GENERAL DECISION MO030001 06/13/03 MO1 General Decision Number MO030001

Superseded General Decision No. MO020001

State: Missouri

Construction Type:

HEAVY HIGHWAY

County(ies):

STATEWIDE

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

COUNTY(ies):
STATEWIDE

CARP0007M 04/01/2001

CARPOUO/M 04/01/2001  CASS (Richards-Gebauer AFB ONLY), PLATTE AND RAY COUNTIES	Rates CLAY, JACKSON,	Fringes
CARPENTERS & PILEDRIVERS	25.50	6.88
CARPOOO8C 05/01/2002 ST. LOUIS COUNTY AND CITY	Rates	Fringes
CARPENTERS		6.83
CARPO011A 05/01/2002 CARPENTERS & PILEDRIVERS:	Rates	Fringes
JEFFERSON AND ST. CHARLES COUNTIES FRANKLIN COUNTY WARREN COUNTY LINCOLN COUNTY PIKE, ST. FRANCOIS AND WASHINGTON COUNTIES BUCHANAN, CLINTON, JOHNSON AND LAFAYETTE COUNTIES ATCHISON, ANDREW, BATES, CALDWELL, CARROLL, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HENRY, HOLT,		6.56 6.56 6.56 6.56 6.56
LIVINGSTON, MERCER, NODAWAY, ST. CLAIR, SALINE AND WORTH COUNTIES BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS,	22.53	6.74

MO030001 1 06/13/03

GREENE, HICKORY, JASPER, LACLEDE, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, STONE, TANEY, VERNON, WEBSTER		
AND WRIGHT COUNTIES	22.18	6.74
CRAWFORD, DENT, GASCONADE, IRON,		
MADISON, MARIES, MONTGOMERY, PHELPS,		
PULASKI, REYNOLDS, SHANNON, AND		
TEXAS COUNTIES	23.88	6.56
AUDRAIN (East of Hwy.19) RALLS, MARION	ı	
LEWIS, CLARK AND SCOTLAND COUNTIES	24.03	6.56
BENTON, MORGAN AND PETTIS COUNTIES	22.33	6.99
AUDRAIN (West of Hwy 19), BOONE,		
COOPER, HOWARD		6.99
CALLAWAY, COLE, MILLER, MONITEAU, OSAGE	23.63	6.99
ADAIR, KNOX, PUTNAM, SCHUYLER AND		
SULLIVAN COUNTIES	23.63	6.99
CHARITON, LINN, MACON, MONROE,		
RANDOLPH AND SHELBY COUNTIES	23.63	6.99
BOLLINGER, BUTLER, CAPE GIRARDEAU,		
DUNKLIN, MISSISSIPPI, NEW MADRID,		
PEMISCOT, PERRY, STE. GENEVIEVE,		
SCOTT, STODDARD AND WAYNE COUNTIES	24.31	6.18
CARTER, HOWELL, OREGON AND		
RIPLEY COUNTIES	23.39	6.18

#### ELEC0001B 06/01/2002

Rates Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, FRANKLIN,
IRON, JEFFERSON, LINCOLN, MADISON, MISSISSIPPI, NEW MADRID,
PEMISCOT, PERRY, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS,
ST. LOUIS (City and County), STE. GENEVIEVE, SCOTT, STODDARD,
WARREN, WASHINGTON AND WAYNE COUNTIES

ELECTRICIANS	29.20	15.64

#### ELEC0002D 09/02/2001

Rates Fringes

ADAIR, AUDRAIN, BOONE, CALLAWAY, CAMDEN, CARTER, CHARITON, CLARK,
COLE, COOPER, CRAWFORD, DENT, FRANKLIN, GASCONADE, HOWARD,
HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCON, LINN, MACON,
MARIES, MARION, MILLER, MONITEAU, MONROE, MONTGOMERY, MORGAN,
OREGON, OSAGE, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS,
RANDOLPH, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, ST.
LOUIS (City and County), STE. GENEVIEVE, SCHUYLER, SCOTLAND,
SHANNON, SHELBY, SULLIVAN, TEXAS, WARREN AND WASHINGTON
COUNTIES.

#### LINE CONSTRUCTION:

Lineman & Cable Splicer	27.48	42% + 2.10
Groundman Equipment Operator	24.60	42% + 2.10
Groundman Winch Driver	20.22	42% + 2.10
Groundman, Groundman Driver	19.47	42% + 2.10

MO030001 2 06/13/03

#### ELEC0053F 08/27/2000

Rates Fringes BATES. BENTON, CARROLL, CASS, CLAY, HENRY, JACKSON, JOHNSON,

BATES, BENTON, CARROLL, CASS, CLAY, HENRY, JACKSON, JOHNSON, LAFAYETTE, PETTIS, PLATTE, RAY, AND SALINE COUNTIES.

T TATE	CONSTRUCTION	٠
I I I I I I I I I I I I I I I I I I I	-	•

Lineman	27.80	9.99
Lineman Operator	25.97	9.46
Groundman Powderman	19.45	7.59
Groundman	18.49	7.31

ANDREW, ATCHINSON, BARRY, BARTON, BUCHANAN, CALDWELL, CEDAR, CHRISTIAN, CLINTON, DADE, DALLAS, DAVIESS, DE KALB, DOUGLAS,

GENTRY, GREENE, GRUNDY, HARRISON, HICKORY, HOLT, JASPER, LACLEDE, LAWRENCE, LIVINGSTON, McDONALD, MERCER, NEWTON, NODAWAY, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER, WORTH, AND WRIGHT COUNTIES.

#### LINE CONSTRUCTION:

Lineman	26.75	9.69
Lineman Operator	25.41	9.30
Groundman Powderman	18.69	7.37
Groundman	17.30	6.98

#### ELEC0095C 06/01/2001

Rates Fringes
BARRY, BARTON, CEDAR, CRAWFORD, DADE, JASPER, LAWRENCE, MCDONALD,
NEWTON, ST CLAIR, AND VERNON COUNTIES

#### ELECTRICIANS:

Electricians	20.51	5.68
Cable Splicers	20.86	5.68

#### ELEC0124I 08/26/2002

Rates Fringes
BATES, BENTON, CARROLL, CASS, CLAY, COOPER, HENRY, JACKSON,
JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY AND SALINE
COUNTIES:

ELECTRICIANS	30.73	12.37

#### ELEC0257C 03/01/2002

Rates Fringes
AUDRAIN (Except, Cuivre Township), BOONE, CALLAWAY, CAMDEN,
CHARITON, COLE, CRAWFORD, DENT, GASCONADE, HOWARD, MARIES,
MILLER, MONITEAU, OSAGE, PHELPS AND RANDOLPH COUNTIES:

Electricians	22.50	11.395
Cable Splicers	23.50	11.395

#### ELEC0350B 12/01/2002

•	•		
		Rates	Fringes

MO030001 3 06/13/03

ADAIR, AUDRAIN (East of Highway 19), CLARK, KNOX, LEWIS, LINN, MACON, MARION, MONROE, MONTGOMERY, PIKE, PUTNAM, RALLS, SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES

ELECTRICIANS	24.25	10.241
ELEC0453D 09/01/2001		
CHRISTIAN, DALLAS, DOUGLAS, OREGON, OZARK, POLK, SHANNON,		, LACLEDE,
ELECTRICIANS	20.85	5.37+10%
PULASKI AND TEXAS COUNTIES		
ELECTRICIANS	25.50	5.37+10%
STONE AND TANEY COUNTIES		
ELECTRICIANS	14.45	4.97+10%
ELEC0545D 06/01/2002		
ANDREW, BUCHANAN, CLINTON, I	Rates	_
GENTRY, HARRISON, DAVIESS, GAND CALDWELL COUNTIES		
ELECTRICANS	26.35	9.54
ELEC0702D 01/01/2002		
	Rates	_
BOLLINGER, BUTLER, CAPE GIRANEW MADRID, PEMISCOT, SCOTT,		
LINE CONSTRUCTION:		
Lineman Groundman Equipment Operat	28.68	2.45+25.5%
(all crawler type equipment	.01	
D-4 and larger)		2.45+25.5%
Groundman - Class A	17.07	2.45+25.5%
	Rates	Fringes
ANDREW, ATCHISON, BATES, BEN CASS, CHARITON, CLINTON, COOPE HARRISON, HENRY, HOLT, HOWARD MERCER, NODAWAY, PETTIS, SALI	R, DAVIESS, DEKALB, GE ), JOHNSON, LAFAYETTE,L	NTRY, GRUNDY, INN,LIVINGSTON,
POWER EQUIPMENT OPERATORS		
GROUP 1	23.15	9.30
GROUP 2 GROUP 3	22.75 20.75	9.30 9.30
31.001 3	20.75	J. J.

MO030001 4 06/13/03

#### POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers - 2; booster pump on dredge; bulldozer operator; boring machine (truck or crane mounted); clamshell operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline

operator; dredge engineman; dredge operator; drill cat with compressor mounted (self-contained) or similar type self-propelled rotary drill (not air tract); drilling or boring machine (rotary-self-propelled); finishing machine operator; greaser; high loader-fork lift-skid loader (all types); hoisting engineer (2 active drums); locomotive operator (standard guage); mechanics and welders (field and plants); mucking machine operator; pile drive operator; pitman crane or boom truck (all types); push cat; quad track; scraper operators (all types); shovel operator; sideboom cats; side discharge spreader; skimmer scoop operators; slip form paver operator (CMI, Rex, Gomeco or equal); la tourneau rooter (all tiller types); tow boat operator; truck crane; wood and log chippers (all types).

GROUP 2: A-frame truck operator; articulated dump truck; back filler operator; boilers (1); chip spreader; churn drill operator; compressor; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grade operator; hoisting engine (one drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydra-hammer (or similar type); paymill operator; power shield; pumps; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; siphons and jets; straw blower; stump cutting machine; siphons and jets; tank car heater operator (combination boiler and booster); welding machine; vibrating machine operator (not hand held); welding machine. GROUP 3: Oiler; oiler driver; mechanic.

#### HOURLY PREMIUMS:

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$ .25) ABOVE GROUP 1 RATE: Dragline operator - 3 yds. & over; shovel 3 yds. & over; clamshell 3 yds. & over; Crane, rigs or piledrivers, 100' of boom or over (incl. jib.), hoist - each additional active drum over 2 drums

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$ .50) ABOVE GROUP 1 RATE: Tandem scoop operator; crane, rigs or piledrivers 150' to 200' of boom (incl. jib.)

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$ .75) ABOVE GROUP 1 RATE: Crane rigs, or piledrivers 200 ft. of boom or over (including jib.)

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ENGI0101E 04/01/2003

CASS, CLAY, JACKSON, PLATTE AND	Rates RAY COUNTIES	Fringes
POWER EQUIPMENT OPERATORS:		
GROUP 1	24.69	9.57
GROUP 2	23.65	9.57
GROUP 3	19.18	9.57
GROUP 4	22.53	9.57

#### POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers-2; booster pump on dredge; boring machine (truck or crane mounted); bulldozer operator; clamshell operator; concrete cleaning decontamination machine operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline operator; dredge engineman; dredge operator; drillcat with compressor mounted (self-contained) or similar type self propelled rotary drill (not air tract); drilling or boring machine (rotary self-propelled); finishing machine operator; greaser; heavy equipment robotics operator/mechanic; horizontal directional drill operator; horizontal directional drill locator; loader-forklift - skid loader (all types); hoisting engineer (2 active drums); locomotive operator (standard quage); master environmental maintenance mechanic; mechanics and welders (field and plants); mucking machine operator; piledrive operator; pitman crane or boom truck (all types); push cat; quad-track; scraper operators (all types); shovel operator; side discharge spreader; sideboom cats; skimmer scoop operator; slip-form paver (CMI, REX, Gomaco or equal); la tourneau rooter (all tiller types); tow boat operator; truck crane; ultra high perssure waterjet cutting tool system operator/mechanic; vacuum blasting machine operator/mechanic; wood and log chippers (all types)

GROUP 2: "A" Frame truck operator; articulated dump truck; back filler operator; boilers (1); chip spreader; churn drill operator; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grader operator; hoisting engine (1 drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydrahammer (or similar type); power shield; paymill operator; pumps; siphons and jets; stump cutting machine; tank car heater operator (combination boiler and booster); compressor; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; straw blower; tank car heater operator (combination boiler and booster); vibrating machine operator (not hand held)

GROUP 3: Oilers

GROUP 4: Oiler Driver (All Types)

MO030001 6 06/13/03

#### FOOTNOTE:

#### HOURLY PREMIUMS

FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$.25) ABOVE GROUP 1 RATE: Clamshells - 3 yd. capacity or over; Cranes or rigs, 80 ft. of boom or over (including jib); Draglines, 3 yd. capacity or over; Piledrivers 80 ft. of boom or over (including jib); Shovels & backhoes, 3 yd. capacity or over.

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#### ENGI0101J 05/01/2003

Rates Fringes
BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS,
GREENE, JASPER, LAWRENCE, HICKORY, LACLEDE, MCDONALD, NEWTON,
OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER AND
WRIGHT COUNTIES and CITY OF SPRINGFIELD

#### POWER EQUIPMENT OPERATORS

GROUP 1	20.92	7.45
GROUP 2	20.57	7.45
GROUP 3	20.37	7.45
GROUP 4	18.32	7.45

#### POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader; asphalt plant console operator; autograder; automatic slipform paver; backhoe; blade operator - all types; boat operator - tow; boilers-2; central mix concrete plant operator; clamshell operator; concrete mixer paver; crane operator; derrick or derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; highloader; hoisting engine - 2 active drums; launch hammer wheel; locomotive operator; - standard guage; mechanic and welders; mucking machine; off-road trucks; piledriver operator; pitman crane operator; push cat operator; quad trac; scoop operator - all types; shovel operator; sideboom cats; skimmer scoop operators; trenching machine operator; truck crane.

GROUP 2: A-frame; asphalt hot-mix silo; asphalt plant fireman (drum or boiler); asphalt plant man; asphalt plant man; asphalt plant mixer operator; asphalt roller operator; backfiller operator; barber-greene loader; boat operator (bridges and dams); chip spreader; concrete mixer operator - skip loader; concrete plant operator; concrete pump operator; crusher operator; dredge oiler; elevating grader operator; fork lift; greaser-fleet; hoisting engine - 1; locomotive operator - narrow gauge; multiple compactor; pavement breaker; powerbroom - self-propelled; power shield; rooter; side discharge concrete spreader; slip form finishing machine; stumpcutter machine; throttle man; tractor operator (over 50 h.p.); winch truck.

GROUP 3: Boilers - 1; chip spreader (front man); churn drill operator; clef plane operator; concrete saw operator (self-propelled); curb finishing machine; distributor operator;

MO030001 7 06/13/03

finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; roller operator, other than high type asphalt; screening & washing plant operator; siphons & jets; sub-grading machine operator; spreader box

operator, self-propelled (not asphalt); tank car heater operator (combination boiler & booster); tractor operator (50 h.p. or less); Ulmac, Ulric or similar spreader; vibrating machine operator, not hand;

GROUP 4: Grade checker; Oiler; Oiler-Driver

#### HOURLY PREMIUMS:

The following classifications shall receive \$ .25 above GROUP 1 rate: Clamshells - 3 yds. or over; Cranes - Rigs or Piledrivers, 100 ft. of boom or over (including jib); Draglines - 3 yds. or over; Hoists - each additional active drum over 2 drums; Shovels - 3 yds. or over;

The following classifications shall receive \$ .50 above GROUP 1 rate: Tandem scoop operator; Cranes - Rigs or Piledrivers, 150 ft. to 200 ft. of boom (including jib); Tandem scoop.

The following classifications shall receive \$ .75 above GROUP 1 rate: Cranes - Rigs or Piledrivers, 200 ft. of boom or over (including jib.).

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#### \* ENGI0513D 05/07/2003

Rates Fringes FRANKLIN, JEFFERSON, LINCOLN, ST CHARLES, AND WARREN COUNTIES

#### POWER EQUIPMENT OPERATORS:

GROUP	1	25.27	13.00
GROUP	2	23.97	13.00
GROUP	3	20.97	13.00
GROUP	4	23.52	13.00

#### POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, Cable; Backhoe, Hydraulic (2 cu yds bucket and under regardless of attachment, one oiler for 2 or 3, two oilers for 4 through 6); Backhoe, Hydraulic over 2 cu yds; Cableway; Crane, Crawler or Truck; Crane, Hydraulic - Truck or Cruiser mounted, 16 tons and over; Crane, Locomotive; crane with boom including jib over 100 ft from pin to pin; Crane using rock socket tool; Derrick, Steam; Derrick Car and Derrick Boat; Dragline, 7 cu yds and over; Dredge; Gradall, Crawler or tire mounted; Locomotive, Gas, Steam & other powers; Pile Driver, Land or Floating; Scoop, Skimmer; Shovel, Power (Electric, Gas, Steam or other powers); Shovel, Power (7 cu yds and over); Switch Boat; Whirley; Air Tugger with air compressor; Anchor Placing Barge; Asphalt Spreaker; Athey Force Feeder Loader, self-propelled; Backfilling Machine; Boat Operator - Push Boat or Tow Boat (job site); Boiler, High Pressure Breaking in Period; Boom Truck, Placing or Erecting; Boring Machine, Footing Foundation; Bullfloat; Cherry Picker; Combination Concrete Hoist and Mixer

MO030001 8 06/13/03

(such as Mixermobile); Compressor, Two 125 CFM and under; Compressor, Two through Four over 125 CFM; Compressor when operator runs throttle; Concrete Breaker (Truck or Tractor

mounted); Concrete Pump (such as Pumpcrete machine); Concrete Saw (self-propelled); Concrete Spreader; Conveyor, Large (not selfpropelled) hoisting or moving brick and concrete into, or into and on floor level, one or both; Crane, Cimbing (such as Linden); Crane, Hydraulic - Rough Terrain, self-propelled; Crane, Hydraulic - Truck or Cruiser mounted - under 16 tons; Drilling machine - Self-powered, used for earth or rock drilling or boring (wagon drills and any hand drills obtaining power from other souces including concrete breakers, jackhammers and Barco equipmnet no engineer required); Elevating Grader; Engine Man, Dredge; Excavator or Powerbelt Machine; Finishing Machine, selfpropelled oscillating screed; Forklift; Generators, Two through Six 30 KW or over; Grader, Road with power blade; Greaser; Highlift; Hoist, Concrete and Brick (Brick cages or concrete skips operating or on tower, Towermobile, or similar equipment); Hoist, Three or more drums in use; Hoist, Stack; Hydro-Hammer; Lad-A-Vator, hoisting brick or concrete; Loading Machine such as Barber-Greene; Mechanic on job site

GROUP 2: Air Tugger with plant air; Boiler (for power or heating shell of building or temporary enclosures in connection with construction work); Boiler, Temporary; Compressor, One over 125 CFM; Compressor, truck mounted; Conveyor, Large (not selfpropelled); Conveyor, Large (not self- propelled) moving brick and concrete (distributing) on floor level; Curb Finishing Machine; Ditch Paving Machine; Elevator (outside); Endless Chain Hoist; Fireman (as required); Form Grader; Hoist, One Drum regardless of size (except brick or concrete); Lad-A-Vator, other hoisting; Manlift; Mixer, Asphalt, over 8 cu ft capacity; Mixer, one bag capacity or less; Mixer, without side loader, two bag capacity or more; Mixer, with side loader, regardless of size, not Paver; Mud Jack (where mud jack is used in conjenction with an air compressor, operator shall be paid \$ .55 per hour in addition to his basic hourly rate for covering both operations); Pug Mill operator; Pump, Sump - self powered, automatic controlled over 2"; Scissor Lift (used for hoisting); Skid Steer Loader; Sweeper, Street; Tractor, small wheel type 50 HP and under with grader blade and similar equipment; Welding Machine, One over 400 amp; Winch, operating from truck

GROUP 3: Boat operator - outboard motor, job site; Conveyors (such as Con-Vay-It) regardless of how used; Elevator (inside); Heater operator, 2 through 6; Sweeper, Floor

#### GROUP 4: Crane type

#### HOURLY PREMIUMS:

Backhoe, Hydraulic 2 cu yds or less without oiler - \$2.00; Certified Crane Operator - \$1.50; Certified Hazardous Material Operator \$1.50; Crane, climbing (such as Linden) - \$.50; Crane, Pile Driving and Extracting - \$.50 Crane with boom (including job) over 100 ft from pin to pin - add \$.01 per foot to maximum of \$4.00); Crane, using rock socket tool - \$.50; Derrick,

MO030001 9 06/13/03

diesel, gas or electric hoisting material and erecting steel (150 ft or more above ground) - \$ .50; Dragline, 7 cu yds and

over - \$ .50; Hoist, Three or more drums in use - \$ .50; Scoop, Tandem - \$.50; Shovel, Power - 7 cu yds and over - \$ .50; Tractor, Tandem Crawler - \$ .50; Tunnel, man assigned to work in tunnel or tunnel shaft - \$ .50; Wrecking, when machines are working on second floor or higher - \$ .50

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### \* ENGI0513G 05/01/2003

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Rates Fringes

ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY, CAPE

GIRARDEAU, CARTER, CLARK, COLE, CRAWFORD, DENT, DUNKLIN,

GASCONADE, HOWELL, IRON, KNOX, LEWIS, MACON, MADISON, MARIES,

MARION, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY,

MORGAN, NEW MADRID, OREGON, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE,

PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. FRANCOIS,

STE. GENEVIEVE, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY,

STODDARD, TEXAS, WASHINGTON, AND WAYNE COUNTIES

21.70	13.00
21.35	13.00
21.15	13.00
17.50	13.00
	21.35 21.15

#### POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader, asphalt plant console operator; autograder; automatic slipform paver; back hoe; blade operator - all types; boat operator tow; boiler two; central mix concrete plant operator; clam shell operator; concrete mixer paver; crane operator; derrick or derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; highloader; hoisting engine 2 active drums; launchhammer wheel; locomotive operator standrad guage; mechanics and welders; mucking machine; piledriver operator; pitman crane operator; push cat operator; guad-trac; scoop operator; sideboom cats; skimmer scoop operator; trenching machine operator; truck crane, shovel operator.

GROUP 2: A-Frame; asphalt hot-mix silo; asphalt roller operator asphalt plant fireman (drum or boiler); asphalt plant man; asphalt plant mixer operator; backfiller operator; barber-greene loader; boat operator (bridge & dams); chip spreader; concrete mixer operator skip loader; concrete plant operator; concrete pump operator; dredge oiler; elevating graded operator; fork lift; grease fleet; hoisting engine one; locomotive operator narrow guage; multiple compactor; pavement breaker; powerbroom self-propelled; power shield; rooter; slip-form finishing machine; stumpcutter machine; side discharge concrete spreader; throttleman; tractor operator (over 50 hp); winch truck; asphalt roller operator; crusher operator.

MO030001 10 06/13/03

GROUP 3: Spreader box operator, self-propelled not asphalt; tractor operator (50 h.p. or less); boilers one; chip spreader

(front man); churn drill operator; compressor over 105 CFM 2-3 pumps 4" & over; 2-3 light plant 7.5 KWA or any combination thereof; clef plane operator; compressor maintenance operator 2 or 3; concrete saw operator (self-propelled); curb finishing mancine; distributor operator; finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; riller operator other than high type asphalt; screening & washing plant operator; siphons & jets; subgrading machine operator; tank car heater (combination boiler & booster); ulmac, ulric or similar spreader; vibrating machine operator; hydrobroom.

GROUP 4: Oiler; grout machine; oiler driver; compressor over 105 CFM one; conveyor operator one; maintenance operator; pump 4" & over one.

#### FOOTNOTE:

#### HOURLY PREMIUMS

Backhoe hydraulic, 2 cu. yds. or under without oiler - \$2.00 Certified Crane Operator - \$1.50; Certified Hazardous Material Operator \$1.50; Crane, climbing (such as Linden) - \$0.50; Crane, pile driving and extracting - \$0.50; Crane, with boom (including jib) over 100' from pin to pin add \$0.01 per foot to maximum of \$4.00; Crane, using rock socket tool - \$0.50; Derrick, diesel, gas or electric, hoisting material and erecting steel (150' or more above the ground) - \$0.50; Dragline, 7 cu. yds, and over - \$0.50; Hoist, three or more drums in use - \$0.50; Scoop, Tandem - \$0.50; Shovel, power - 7 cu. yds. or more - \$0.50; Tractor, tandem crawler - \$0.50; Tunnel, man assigned to work in tunnel or tunnel shaft - \$0.50; Wrecking, when machine is working on second floor or higher - \$0.50;

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## ENGI0513H 05/07/2003

	Rates	Fringes
ST. LOUIS CITY AND COUNTY		
POWER EQUIPMENT OPERATORS:		
GROUP 1	25.27	13.00
GROUP 2	25.27	13.00
GROUP 3	23.37	13.00
GROUP 4	20.37	13.00
GROUP 5	19.91	13.00

# POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, cable or hydraulic; cableway; crane, crawler or truck; crane, hydraulic-truck or cruiser mounted 16 tons & over; crane locomotive; derrick, steam; derrick car & derrick boat; dragline; dredge; gradall, crawler or tire mounted; locomotive, gas, steam & other powers; pile driver, land or floating; scoop, skimmer; shovel, power (steam, gas, electric,

MO030001 11 06/13/03

or other powers); switch boat; whirley.

GROUP 2: Air tugger w/air compressor; anchor-placing barge; asphalt spreader; athey force feeder loader (selfpropelled); backfilling machine; backhoe-loader; boat operator-push boat or tow boat (job site); boiler, high pressure breaking in period; boom truck, placing or erecting; boring machine, footing foundation; bullfloat; cherry picker; combination concrete hoist & mixer (such as mixer mobile); compressor (when operator runs throttle); concrete breaker (truck or tractor mounted); concrete pump, such as pump-crete machine; concrete saw (self-propelled), concrete spreader; conveyor, large (not self-propelled), hoisting or moving brick and concrete into, or into and on floor level, one or both; crane, hydraulic-rough terrain, self-propelled; crane hydraulic-truck or cruiser mounted-under 16 tons; drilling machines, self-powered use for earth or rock drilling or boring (wagon drills and any hand drills obtaining power from other sources including concrete breakers, jackhammers and barco equipment-no engineer required); elevating grader; engineman, dredge; excavator or powerbelt machine; finishing machine, self-propelled oscillating screed; forklift; grader, road with power blade; highlift; greaser; hoist, stack, hydro-hammer; loading machine (such as barber-greene); machanic, on job site; mixer, pipe wrapping machines; plant asphalt; plant, concrete producing or ready-mix job site; plant heating-job site; plant mixing-job site; plant power, generating-job site; pumps, two through six self-powered over 2"; pumps, electric submersible, two through six, over 4"; quadtrack; roller, asphalt, top or sub-grade; scoop, tractor drawn; spreader box; sub-grader; tie tamper; tractorcrawler, or wheel type with or without power unit, power take-offs and attachments regardless of size; trenching machine; tunnel boring machine; vibrating machine automatic, automatic propelled; welding machines (gasoline or diesel) two through six; well drilling machine

GROUP 3: Conveyor, large (not self-propelled); con-; veyor, large (not self-propelled) moving brick and concrete distributing) on floor level; mixer two or more mixers of one bag capacity or less; air tugger w/plant air; boiler, for power or heating on construction projects; boiler, temporary; compressor (mounted on truck; curb finishing machine; ditch paving machine; elevator; endless chain hoist; form grader; hoist, one drum regardless of size; lad-a-vator; manlift; mixer, asphalt, over 8 cu. ft. capacity, without side loader, 2 bag capacity or more; mixer, with side loader, regardless of size; pug mill operator; pump, sump-self-powered, automatic controlled over 2" during use in connection with construction work; sweeper, street; welding machine, one over 400 amp.; winch operating from truck; scissor lift (used for hoisting); tractor, small wheel type 50 h.p.

MO030001 12 06/13/03

& under with grader blade & similar equipment

GROUP 4: Boat operator-outboard motor (job site);
 conveyor (such as con-vay-it) regardless of how used;
 sweeper, floor

GROUP 5: Oiler on dredge and on truck crane.

# HOURLY PREMIUMS:

Backhoe, hydraulic		
2 cu. yds. or under without oiler	\$2.00	
Certified Crane Operator	1.50	
Certified Hazardous Material Operator	1.50	
Crane, climbing (such as Linden)	.50	
Crane, pile driving and extracting	.50	
Crane, with boom (including jib) over		
100' (from pin to pin) add \$.01		
per foot to maximum of	4.00	
Crane, using rock socket tool	.50	
Derrick, diesel, gas or electric,		
hoisting material and erecting steel		
(150' or more above ground)	.50	
Dragline, 7 cu. yds. and over	.50	
Hoist, three (3) or more drums in use	.50	
Scoop, Tandem	.50	
Shovel, power - 7 cu. yds. or more	.50	
Tractor, tandem crawler	.50	
Tunnel, man assigned to work in tunnel		
or tunnel shaft	.50	
Wrecking, when machine is working on		
second floor or higher	.50	

IRON0010M 04/01/2003

Rates Fringes
BUCHANAN, CASS, CLAY, JACKSON, JOHNSON, LAFAYETTE, PLATTE AND
RAY Counties

IRONWORKERS 24.10 13.73

ANDREW, ATCHISON, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDER CHARITON, CHRISTIAN, CLINTON, COOPER, DADE, DALLAS, DAVIESS, DE KALB, GENTRY, GREENE, GRUNDY, HARRISON, HENRY, HICKORY, HOLT, HOWARD, LACLEDE, LINN, LIVINGSTON, MERCER, MONITEAU, MORGAN, NODAWAY, PETTIS, POLK, PUTNAM, RANDOLPH, ST. CLAIR, SALINE, SULLIVAN, TANEY, VERNON, WEBSTER, WRIGHT and WORTH Counties; and portions of ADAIR, BOONE, MACON, MILLER, and RANDOLPH Counties

IRONWORKERS	21.10	13.73

IRON0321C 12/31/2002

Rates Fringes

DOUGLAS, HOWELL and OZARK COUNTIES

IRONWORKERS	18.00	8.06			
IRON0396D 07/31/2002  ST. LOUIS (City and County), ST. CFFRANKLIN, LINCOLN, WARREN, WASHINGT GENEVIEVE, and REYNOLDS Counties; a BOLLINGER, WAYNE, and CARTER Counti	TON, ST. FRANCOIS and portions of M	, IRON, , STE.			
IRONWORKERS	26.54	11.73			
IRON0396I 08/01/2002  AUDRAIN, CALLAWAY, COLE, CRAWFORD, MONTGOMERY, OSAGE, PHELPS, PIKE, PU Counties; and portions of CAMDEN, I OREGON, BOONE, SHANNON, LACLEDE, MC	JLASKI, TEXAS, and DOUGLAS, HOWELL,	MARIES, d WRIGHT MILLER,			
IRONWORKERS	21.77	11.59			
IRON0577F 06/01/2002  ADAIR, CLARK, KNOX, LEWIS, MACON, M SCHUYLER, SCOTLAND, AND SHELBY COUN		_			
IRONWORKERS	20.85	9.16			
IRON0584E 06/01/2001 BARRY, JASPER, LAWRENCE, MCDONALD,		Counties			
IRONWORKERS	18.20	7.87 			
IRON0782D 03/01/2003  Rates Fringes CAPE GIRARDEAU, MISSISSIPPI, NEW MADRID, SCOTT, & STODDARD Counties; and portions of BOLLINGER, BUTLER, CARTER, DUNKLIN, MADISON, PEMISCOT, PERRY, RIPLEY, and WAYNE Counties					
IRONWORKERS: All Major River Work (Dams, Bridges): Projects \$20 million or more All Other Work	20.65	9.88 9.46			
LABO0042C 03/03/2003	Rates	Fringes			

MO030001 14 06/13/03

ST. LOUIS (City and County)

LABORERS: Plumber Laborers	23.97	7.43
LABO0042H 03/03/2003 ST. LOUIS (City and County)	Rates	Fringes
LABORERS: Laborers, Flagperson Wrecking Dynamiter, Powderman	23.78 23.66 24.28	7.43 7.43 7.43
LABO0424B 05/01/2002 FRANKLIN COUNTY	Rates	Fringes
LABORERS GROUP 1 GROUP 2	21.65 22.25	6.40 6.40
JEFFERSON COUNTY		
LABORERS GROUP 1 GROUP 2	21.70 22.30	6.40 6.40
ADAIR, AUDRAIN, BOLLINGER, BOONE, GIRARDEAU, CARTER, CHARITON, CLARI DUNKLIN, GASCONADE, HOWARD, HOWELD MACON, MADISON, MARIES, MARION, M. MONROE, NEW MADRID, OREGON, OSAGE PULASKI, PUTNAM, RALLS, RANDOLPH, STE. GENEVIEVE, SCHUYLER, SCOTLANI STODDARD, SULLIVAN, TEXAS, WASHING LABORERS	K, COLE, COOPER L, IRON, KNOX, ILLER, MISSISSI , PEMISCOT, PER REYNOLDS, RIPI D, SCOTT, SHANN	R, CRAWFORD, DENT, LEWIS, LINN, LPPI, MONITEAU, RRY, PHELPS, PIKE, LEY, ST. FRANCOIS, ION, SHELBY,
GROUP 1 GROUP 2	20.20	6.40 6.40

# LABORERS CLASSIFICATIONS

LINCOLN, MONTGOMERY AND WARREN COUNTIES

LABORERS GROUP 1

GROUP 2

GROUP 1 - General laborer-flagman, carpenter tenders; salamander

Tenders; Dump Man; Ticket Takers; loading trucks under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggie man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap pavers rock, block or brick;

MO030001 15 06/13/03

20.45

21.05

6.40

6.40

scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors.

GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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LABO0579F 05/01/2003		
	Rates	Fringes
BUCHANAN AND LAFAYETTE COUNTIES		
LABORERS		
GROUP 1	18.74	7.49
GROUP 2	19.09	7.49

ANDREW, ATCHISON, BARRY, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDAR, CHRISTIAN, CLINTON, DADE, DALLAS, DAVIESS, DEKALB, DOUGLAS, GREENE, GENTRY, GRUNDY, HARRISON, HENRY, HICKORY, HOLT, JASPER, JOHNSON, LACLEDE, LAWRENCE, LIVINGSTON, MCDONALD, MERCER, MORGAN, NEWTON, NODAWAY, OZARK, PETTIS, POLK, ST. CLAIR, SALINE, STONE, TANEY, VERNON, WEBSTER, WORTH AND

WRIGHT COUNTIES.

LABORERS		
GROUP 1	17.29	7.24
GROUP 2	17.84	7.24

### LABORERS CLASSIFICATIONS

GROUP 1: General Laborers - Carpenter tenders; salamander tenders; loading trucks under bins; hoppers & conveyors; track men & all other general laborers; air tool operator; cement handler-bulk or sack; dump man on earth fill; georgie buggie man; material batch hopper man; material mixer man (except on manholes); coffer dams; riprap pavers - rock, block or brick; signal man; scaffolds over ten feet not self-supported from ground up; skipman on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoline, oil drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator, all work in connection with hydraulic or general dredging operations; puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material or materials (where special protection is required); rubbing concrete; topper of standing trees; batter board man on pipe and ditch work; feeder man on wood pulverizers; board and willow mat weavers and cable tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 feet where compressed air is not used; abutment and pier hole men working six (6) feet or more below ground; men working in coffer dams for bridge piers and footings in the river; ditchliners; pressure groutmen; caulker; chain or concrete saw; cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground; mortarmen on brick or block manholes; toxic and hazardous waste work.

GROUP 2: Skilled Laborers - Head pipe layer on sewer work; laser beam man; Jackson or any other similar tamp; cutting torch man; form setters; liners and stringline men on concrete paving, curb, gutters; hot mastic kettleman; hot tar applicator; sandblasting and gunite nozzlemen; air tool operator in tunnels; screed man on asphalt machine; asphalt raker; barco tamper; churn drills; air track drills and all similar drills; vibrator man; stringline man for electronic grade control; manhole builders-brick or block; dynamite and powder men; grade checker.

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ST. CHARLES COUNTY	Rates	Fringes
LABORERS:		
GROUP 1	22.69	7.10
GROUP 2	23.19	7.10

### LABORERS CLASSIFICATIONS

GROUP 1: General laborer; carpenter tender; salamander tender; dump man; ticket takers; flagman; loading trucks under bins, hoppers, and conveyors; track men; cement handler; dump man on earth fill; Georgie buggie man; material batch hopper man; spreader on asphalt machine; material mixer man (except on

MO030001 17 06/13/03

manholes); coffer dams; riprap paver - rock, block, or brick; signal man; scaffolds over 10 ft not self-supported from ground up; skipman on concrete paving; wire mech setters on concrete paving; all work in connection with sewer, water, gas, gasoline, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters; puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizer; board and w llow mat weavers and cable tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft where compressed air is not used; abutment and pier hole men working 6 ft or more below ground; men working in coffer dams for bridge piers and footings in the river; Barco tamper, Jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditchliners; hot mastic kettleman; hot tar applicator; hand blade operators; mortar men on brick or block manholes; rubbing concrete; air tool operator under 65 pounds; caulker and lead man; chain saw under 15 hp; guard rail and sign erectors

GROUP 2: Vibrator man; asphalt raker; hand pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from Bosun's chairs, scaffolds or platforms on dams or power plants over 10 ft high; air tool operator over 65 pounds; stringline man on concrete paving etc.; sand blast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills; gunnite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 hp and over; grade checker; stringline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi and over; asbestos and/or hazardous waste removal and or disposal;

# LABO0663D 04/01/2003

						Rates	Fringes
CASS,	CLAY,	JACKSON,	PLATTE	AND	RAY	COUNTIES	
LABORI	ERS:						
GROUI	2 1					21.46	7.79
GROUI	2					22.59	7.79

## LABORERS CLASSIFICATIONS

GROUP 1: General laborers, Carpenter tenders, salamander tenders, loading trucks under bins, hoppers and conveyors, track men and all other general laborers, air tool operator, cement handler (bulk or sack), chain or concrete saw, deck hands, dump man on earth fill, Georgie Buggies man, material batch hopper man, scale man, material mixer man (except on manholes), coffer dams, abutments and pier hole men working below ground, riprap pavers rock, black or brick, signal man, scaffolds over ten feet not self-supported from ground up, skipman on concrete paving,

MO030001 18 06/13/03 wire mesh setters on concrete paving, all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipelines, power tool operator, all work in connection with hydraulic or general dredging operations, straw blower nozzleman, asphalt plant platform man, chuck tender, crusher feeder, men handling creosote ties on creosote materials, men working with and handling epoxy material or materials (where special protection is required), topper of standing trees, batter board man on pipe and ditch work, feeder man on wood pulverizers, board and willow mat weavers and cable tiers on river work, deck hands, pile dike and revetment work, all laborers working on underground tunnels less than 25 feet where compressed air is not used, abutment and pier hole men working six (6) feet or more below ground, men working in coffer dams for bridge piers and footings in the river, ditchliners, pressure groutmen, caulker and chain or concrete saw, cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground, mortarmen on brick or block manholes, signal man.

GROUP 2: Skilled Laborer - spreader or screed man on asphalt machine, asphalt raker, grade checker, vibrator man, concrete saw over 5 hp., laser beam man, barco tamper, jackson or any other similar tamp, wagon driller, churn drills, air track drills and other similar drills, cutting torch man, form setters, liners and stringline men on concrete paving, curb, gutters and etc., hot mastic kettleman, hot tar applicator, hand blade operators, mortar men on brick or block manholes, sand blasting and gunnite nozzle men, rubbing concrete, air tool operator in tunnels, head pipe layer on sewer work, manhole builder (brick or block), dynamite and powder men.

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# PAIN0002B 09/01/2002

Rates Fringes
CLARK, FRANKLIN, JEFFERSON, LEWIS, LINCOLN, MARION, PIKE, RALLS,
ST. CHARLES, ST. LOUIS (CITY & COUNTY), AND WARREN COUNTIES

PAINTER	· c

Spray	26.93	7.50
Brush	24.93	7.50

PAIN0002G 02/01/2003

Rates Fringes

ADAIR, AUDRAIN, BOONE, CALLAWAY, CHARITON, COLE, GASCONADE, HOWARD, KNOX, LINN, MACON, MONROE, MONTGOMERY, OSAGE, PUTNAM, RANDOLPH, SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES and the City of Booneville.

# PAINTERS:

Brush, Roller, Paperhanger,		
Tapers	18.44	5.33
Tapers using Ames or comparable		
tools (bazooks, etc.)	18.69	5.33
Spray; Water Base Epoxy;		

Stage Under 50 ft.; Structural Steel (except for stairs and railings) Sandblasting; Epoxy or Any Two Part Coating; Stage or Other Aerial Work Platforms Over 50 ft. high;	18.94	5.33
Lead Abatement	19.44	5.33
Bridges, Dams, Locks or Powerhouses	20.44	5.33
PAIN0003D 04/01/2000	Datos	Eringog
BATES, BENTON, CALDWELL, CARROLL, DAVIESS, GRUNDY, HARRISON, HENRY, LIVINGSTON, MERCER, MONITEAU, MORG SALINE COUNTIES	JACKSON, JOHNSON	NTON, COOPER, N, LAFAYETTE,
PAINTERS:		
Brush & Roller; Taper	22.10	6.01
Bazooka; Paperhanger	22.60	6.01
Storage Bin & Tanks (Roller or Brush); Elevated Tanks (Roller or Brush); Stageman; Beltman; Bridgeman; Steelman; Sand Blast		
(Base); Elevator Shaft	22.85	6.01
Lead Abatement; Sprayman	23.10	6.01
Sandblast (Bridge, Stage, Erector Steel and Storage Bin and Tanks) Sprayman (Storage Bin & Tanks, Elevated Tanks); Stageman (Spray) Bridgeman (Spray); Steelman	23.60	6.01
(Spray)	23.85	6.01
Steeplejack (other than Elevated		
Tanks)	26.79	6.01
Steeplejack -Spray or Sandblast (other than Elevated Tanks)	27.79	6.01
PAIN0098B 05/01/2000	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, DE KAI WORTH COUNTIES	LB, GENTRY, HOLT,	, NUDAWAY &
PAINTERS:		
Brush & Roller	20.50	4.40
Sandblasters	21.50	4.40
Steeple Jack	23.50	4.40

# PAIN0203B 04/01/2002

Rates Fringes
BARRY, BARTON, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE,
HICKORY, HOWELL, JASPER, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK,
ST. CLAIR, STONE, TANEY, VERNON, WEBSTER and WRIGHT COUNTIES

MO030001 20 06/13/03

PAINTERS:			
Sandblasters & Highman (over			
40')	18.13	4.89	
Painters	17.58	4.89	
Tapers	17.67	4.53	
DATM10650 07/01/0000			
PAIN1265C 07/01/2002	Patos	Fringes	
CAMDEN, CRAWFORD, DENT, LACLEDE, AND TEXAS COUNTIES			
PAINTERS:			
Brush and Roller, Spray	18.04	7.87	
Structural Steel,			
Sandblasting and all Tank			
Work	19.29	7.87	
Lead Abatement	20.29	7.87	
PAIN1292B 07/01/2001			
	Rates	Fringes	
BOLLINGER, BUTLER, CAPE GIRARDEAU	, CARTER, DUNKL	IN, MISSISSIPPI,	
NEW MADRID, OREGON, PEMISCOT, PER		IPLEY, SCOTT,	
SHANNON, STODDARD and WAYNE COUNT	IES		
PAINTERS:			
Commercial	15.44	5.97	
Industrial	17.94	5.97	
Bridges, Stacks & Tanks	22.89	5.97	
Taper (Tools)	15.69	5.97	
Spray & Abrasive Blasting	17.44	5.97	
Waterblasting	17.44	5.97	
Height Rates (All Areas): Over 60 ft. \$0.50 per hour.  Under 60 ft. \$0.25 per hour.			
PAIN1292F 07/01/2001			
	Rates	Fringes	
IRON, MADISON, ST. FRANCOIS, STE. COUNTIES	GENEVIEVE and	WASHINGTON	
PAINTERS:			
Commercial	17.54	5.97	
Industrial	18.54	5.97	
Tapers (Tools)	17.79	5.97	
Bridges, Stacks & Tanks	22.89	5.97	
Spray & Abrasive Blasting	19.54	5.97	
Waterblasting	19.54	5.97	
Lead Abatement	18.29	5.97	

Height Rates (All Areas): Over 60 ft. \$0.50 per hour Under 60 ft. \$0.25 per hour.

MO030001 21 06/13/03

PLAS0518F	04/01/2002
PLASUSTRE	04/01/2002

PLAS0518F 04/01/2002		
DADDY DADWON GEDAR GURTONIAN	Rates	<del>-</del>
BARRY, BARTON, CEDAR, CHRISTIAN, GREENE, HOWELL, JASPER, LACLEDE,		
OZARK, POLK, STONE, TANEY, VERNON		
CEMENT MASONS	17.31	3.84
PLAS0518G 04/01/2001		
	Rates	_
CASS (Richards-Gebaur AFB only), COUNTIES	CLAY, JACKSON,	PLATTE AND RAY
CEMENT MASONS	21.25	8.15
PLAS0518K 05/01/2001		
	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, BATES		
(Except Richards-Gebaur AFB) CLIN		
GENTRY, GRUNDY, HARRISON, HOLT, J. MACON, MERCER, NODAWAY AND WORTH		IIE, LIVINGSION,
CEMENT MASONS	23.13	7.15
PLAS0527A 05/01/2003		
	Rates	Fringes
JEFFERSON, ST. CHARLES COUNTIES		
AND ST. LOUIS (City and County)		
CEMENT MASONS	26.18	9.36
FRANKLIN, LINCOLN, AND WARREN COU	NTIES	
CEMENT MASONS	25.01	9.36
PLAS0527D 05/01/2003		
CRAWFORD, DENT, IRON, MADISON, MA	Rates	
RALLS, REYNOLDS, ST. FRANCOIS, ST		
WASHINGTON COUNTIES		22220,
CEMENT MASONS	23.70	9.28
PLAS0908A 05/01/2002		
	Rates	3
BOLLINGER, BUTLER, CAPE GIRARDEAU		
NEW MADRID, OREGON, PEMISCOT, PER WAYNE COUNTIES	KY, KIPLEY, SC	JTT, STODDARD, AND
MAINE COONITED		
CEMENT MASONS	17.40	8.95

MO030001 22 06/13/03

PLAS0908G 03/01/2002 Rates BENTON, CALLAWAY, CAMDEN, COLE, GASCONADE, HENRY, HICKORY, JOHNSON, MARIES, MILLER, MONTGOMERY, MORGAN, OSAGE, PETTIS, SALINE & ST. CLAIR COUNTIES CEMENT MASONS 17.81 7.65 PLUM0008C 06/01/2002 Rates CASS, CLAY, JACKSON, JOHNSON, PLATTE COUNTIES PLUMBERS 28.44 11.61 BATES, BENTON, CARROLL, HENRY, LAFAYETTE, MORGAN, PETTIS, RAY, ST. CLAIR, SALINE, AND VERNON COUNTIES 26.00 PLUMBERS PLUM0035C 01/01/2000 Fringes Rates CAMDEN, COLE, CRAWFORD, FRANKLIN, JEFFERSON, MARIES, MILLER, MONITEAU, OSAGE, PHELPS, PULASKI, ST. CHARLES, ST. LOUIS (City and County), WARREN and WASHINGTON COUNTIES PLUMBERS \_\_\_\_\_\_ PLUM0045D 09/01/2002 Rates ANDREW, ATCHISON, BUCHANAN, CALDWELL, CLINTON, DAVIESS, DEKALB, GENTRY, HARRISON, HOLT, NODAWAY AND WORTH COUNTIES PLUMBERS & PIPEFITTERS 27.70 PLUM0178D 11/01/2001 Rates BARRY, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, LACLEDE, LAWRENCE, POLK, STONE, TANEY, WEBSTER, AND WRIGHT COUNTIES PLUMBERS & PIPEFITTERS 22.10 7.37 PLUM0317B 07/01/1995 Rates BOONE, CALLAWAY, COOPER, HOWARD, AND RANDOLPH COUNTY (Southern half)

PLUM0533E 06/01/2002

PLUMBERS & PIPEFITTERS

19.18

Rates

BATES, BENTON, CARROLL, CASS, CLAY, HENRY, HICKORY, JACKSON, JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY, SALINE, ST. CLAIR AND VERNON COUNTIES

PIPEFITTERS	29.78	11.68

PLUM0562D 07/01/2002

Rates Fringes ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY, CAMDEN, CAPE GIRARDEAU, CARTER, CHARITON, CLARK, COLE, COOPER, CRAWFORD, DENT, DUNKLIN, FRANKLIN, GASCONADE, GRUNDY, HOWARD, HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCOLN, LINN, LIVINGSTON, MACON, MADISON, MARIES, MARION, MERCER, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY, NEW MADRID, OREGON, OSAGE, PEMISCOTT, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. CHARLES, ST.FRANCOIS, STE. GENEVIEVE, ST. LOUIS, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY, STODDARD, SULLIVAN, TEXAS, WARREN, WASHINGTON, AND WAYNE COUNTIES.

PIPEFITTERS	28.75	12.08
DI IMOCEOD 07/01/1000		
PLUM0658B 07/01/1998  BARTON, JASPER, MCDONALD, AND NEW	Rates	Fringes
PLUMBERS & PIPEFITTERS	16.73	5.33

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TEAM0013H 05/01/2002

Rates AUDRAIN, BOLLINGER, BOONE, CALLAWAY, CAPE GIRARDEAU, CARTER, COLE, CRAWFORD, DENT, GASCONADE, IRON, MACON, MADISON, MARIES, MARION, MILLER, MISSISSIPPI, MONROE, MONTGOMERY, NEW MADRID, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE, PULASKI, RALLS, REYNOLDS,

ST. FRANCOIS, STE. GENEVIEVE, SCOTT, SHANNON, SHELBY, STODDARD, TEXAS, WASHINGTON, AND WAYNE COUNTIES

TRUCK DRIVERS:		
GROUP 1	22.52	5.50
GROUP 2	22.68	5.50
GROUP 3	22.67	5.50
GROUP 4	22.79	5.50

ADAIR, BUTLER, CLARK, DUNKIN, HOWELL, KNOX, LEWIS, OREGON, PUTNAM, RIPLEY, SCHUYLER, AND SCOTLAND COUNTIES

TRUCK DRIVERS:		
GROUP 1	21.79	5.50
GROUP 2	21.95	5.50
GROUP 3	21.94	5.50
GROUP 4	22.06	5.50

TRUCK DRIVERS CLASSIFICATIONS:

GROUP 1: Flat Bed Trucks, Single Axle; Station Wagons; Pickup Trucks; Material Trucks, Single Axle; Tank Wagon, Single Axle

GROUP 2: Agitator and Transit Mix Trucks

GROUP 3: Flat Bed Trucks, Tandem Axle; Articulated Dump Trucks; Material Trucks, Tandem Axle; Tank Wagon, Tandem Axle

GROUP 4: Semi and/or Pole Trailers; Winch, Fork & Steel Trucks; Distributor Drivers and Operators; Tank Wagon, Semi-Trailer; Insley Wagons, Dumpsters, Half-Tracks, Speedace, Euclids and other similar equipment; A-Frame and Derrick Trucks; Float or Low Boy

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# TEAM0056A 05/01/2002

	Rates	Fringes
BUCHANAN, JOHNSON AND LAFAYETTE	COUNTIES	
TRUCK DRIVERS:		
GROUP 1	23.43	5.50
GROUP 2	23.54	5.50
GROUP 3	23.58	5.50
GROUP 4	23.65	5.50
GROUP 5	23.33	5.50

ANDREW, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDAR, CHARITON, CHRISTIAN, CLINTON, COOPER, DADE, DALLAS, DAVIESS, DEKALB, DOUGLAS, GREENE, HENRY, HICKORY, HOWARD, JASPER, LACLEDE, LAWRENCE, LINN, LIVINGSTON, MONITEAU, MORGAN, NEWTON, PETTIS, POLK, RANDOLPH, ST CLAIR, SALINE, VERNON, WEBSTER, AND WRIGHT COUNTIES

# TRUCK DRIVERS:

GROUP	1	22.22	5.50
GROUP	2	22.38	5.50
GROUP	3	22.37	5.50
GROUP	4	22.49	5.50
GROUP	5	22.12	5.50

ATCHISON, BARRY, GENTRY, GRUNDY, HARRISON, HOLT, MCDONALD, MERCER, NODADWAY, OZARK, STONE, SULLIVAN, TANEY AND WORTH COUNTIES

# TRUCK DRIVERS:

GROUP	1	21.49	5.50
GROUP	2	21.65	5.50
GROUP	3	21.64	5.50
GROUP	4	21.76	5.50
GROUP	5	21.39	5.50

# TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Flat bed trucks single axle; station wagons; pickup trucks; material trucks single axle; tank wagons single axle.

GROUP 2: Agitator and transit mix-trucks.

GROUP 3: Flat bed trucks tandem axle; articulated dump trucks; material trucks tandem axle; tank wagons tandem axle.

GROUP 4: Semi and/or pole trailers; winch, fork & steel trucks; distributor drivers & operators; tank wagons semitrailer; insley wagons, dumpsters, half-tracks, speedace, euclids & other similar equipment; A-frames and derrick trucks; float or low boy.

## GROUP 5: Warehousemen.

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### TEAM0245C 03/25/1998

Rates Fringes
BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DALLAS, DENT, DOUGLAS,
GREENE, HICKORY, HOWELL, JASPER, LACLEDE, LAWRENCE, MCDONALD,
MILLER, NEWTON, OZARK, PHELPS, POLK, PULASKI, SHANNON, STONE,
TANEY, TEXAS, VERNON, WEBSTER AND WRIGHT COUNTIES

#### TRUCK DRIVERS:

Traffic Control Service Driver 12.90 3.56+a

PAID HOLIDAYS: New Year's Day, Decoration Day, July 4th, Labor Day, Thanksgiving Day, Christmas Day, Employee's birthday and 2 personal days.

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## TEAM0541A 04/01/2003

	Rates	Fringes
CASS, CLAY, JACKSON, PLATTE AND	RAY COUNTIES	
TRUCK DRIVERS:		
GROUP 1	24.12	7.25
GROUP 2	23.59	7.25
GROUP 3	23.09	7.25

#### TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Mechanics and Welders, Field; A-Frame Low Boy-Boom Truck Driver.

GROUP 2: Articulated Dump Truck; Insley Wagons: Dump Trucks, Excavating, 5 cu yds and over; Dumpsters; Half-Tracks: Speedace: Euclids & similar excavating equipment.

Material trucks, Tandem Two teams; Semi-Trailers;
Winch trucks-Fork trucks; Distributor Drivers and Operators; Agitator and Transit Mix; Tank Wagon Drivers, Tandem or Semi; One Team; Station Wagons; Pickup Trucks; Material Trucks, Single Axle; Tank Wagon Drivers, Single Axle

GROUP 3: Oilers and Greasers - Field

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MO030001 26 06/13/03

# TEAM0541C 03/25/2000

Rates Fringes

BATES, CASS, CLAY, HENRY, JACKSON, JOHNSON, LAFAYETTE, PLATTE, AND RAY COUNTIES

#### TRUCK DRIVERS:

GROUP 4

Traffic Control Service Driver 14.15 2.44+a

a. PAID HOLIDAYS: New Year's Day, Decoration Day, July 4th, Labor Day, Thanksgiving Day, Christmas Day, Employee's birthday and 2 personal days.

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TEAM0682D 05/01/2002	Dahar	Tire :
ST LOUIS CITY AND COUNTY	Rates	Fringes
TRUCK DRIVERS:		
GROUP 1	22.435	3.46+a+b
GROUP 2	22.635	3.46+a+b
GROTIP 3	22 735	3 46+a+b

21.925

3.46 + a + b

- a. PENSION: \$22.80 per day, \$114.00 maximum per week.
- b. HAZMAT PREMIUM: If Hazmat certification on a job site is required by a state or federal agency or requested by project owner or by the employer, employees on that job site shall receive \$1.50 premium pay.

# TRUCK DRIVERS CLASSIFICATIONS

- GROUP 1 Pick-up trucks; forklift, single axle; flatbed trucks; job site ambulance, and trucks or trailers of a water level capacity of 11.99 cu. yds. or less
- GROUP 2 Trucks or trailers of a water level capacity of 12.0 cu yds. up to 22.0 cu yds. including euclids, speedace and similar equipment of same capacity and compressors
- GROUP 3 Trucks or trailers of a water level capacity of 22.0 cu. yds & over including euclids, speedace & all floats, flatbed trailers, boom trucks, winch trucks, including small trailers, farm wagons tilt-top trailers, field offices, tool trailers, concrete pumps, concrete conveyors & gasoline tank trailers and truck mounted mobile concrete mixers

# GROUP 4 - Warehousemen.

### FOOTNOTE FOR TRUCK DRIVERS:

- a. PAID HOLIDAYS: Christmas Day, Independence Day, Labor Day, Memorial Day, Veterans Day, New Years Day, Thanksgiving Day
- PAID VACATION: 3 days paid vacation for 600 hours of service in any one contract year; 4 days paid vacation for

800 hours of service in any one contract year; 5 days paid vacation for 1,000 hours of service in any one contract year.

When such an employee has completed 3 years of continuous employment with the same employer and then works the above required number of hours, he shall receive double the number of days of vacation specified above.

When such an employee has completed 10 years of continuous employment with the same employer and then works the above required number of hours, he shall receive triple the number of days of vacation specified above.

When such an employee has completed 15 years of continuous employment with the same employer and then works the above required number of hours, he shall receive 4 times the number of days of vacation specified above.

\_\_\_\_\_

### TEAM0682E 05/01/2002

Rates Fringes ST.CHARLES, FRANKLIN, JEFFERSON, LINCOLN AND WARREN COUNTIES:

#### TRUCK DRIVERS:

GROUP 1	22.435	3.46+a+b+c
GROUP 2	22.635	3.46+a+b+c
GROUP 3	22.735	3.46+a+b+c
GROUP 4	21.925	3.46+a+b+c

- a.PAID HOLIDAYS: Christmas, Fourth of July, Labor Day, Memorial Day, Veterans Day, to be celebrated on either its National Holiday or on the day after Thanksgiving, whichever is agreed upon by the Association and the Union, New Year's Day and Thanksgiving Day.
  - PAID VACATION: 3 days paid vacation for 600 hours of service in any one contract year; 4 days paid vacation for 800 hours of service in any one contract year; 5 days paid vacation for 1,000 hours of service in any one contract year.

When such an employee has completed 3 years of continuous employment with the same employer and then works the above required number of hours, he shall receive double the number of days of vacation specified above.

When such an employee has completed 10 years of continuous employment with the same employer and then works the above required number of hours, he shall receive triple the number of days of vacation specified above.

When such an employee has completed 15 years of continuous employmen with the same employer and then works the above required number of hours,

MO030001 28 06/13/03

he shall receive 4 times the number of days of vacation specified above.

- b.Pension: \$22.80 per day either worked or compensated to a maximum of \$114.00 per week.
- c.Hazmat Pay: If Hazmat Certification on a job site is required by a state or federal agency or requested by project owner or by the employer, employees on that job site shall receive \$1.50 per hour premium pay.

#### TRUCK DRIVER CLASSIFICATIONS:

- GROUP 1: Trucks or Trailers of a Water Level Capacity of 11.99 cu. yds. or less, Forklift Trucks, Job Site Ambulances, Pickup Trucks, Flatbed Trucks.
- GROUP 2: Trucks or Trailers of a Water Level Capacity of 12.0 cu. yds. up to 22 cu. yds., Euclids, Speedace and Similar Equipment of Same Capacity and Compressors.
- GROUP 3: Trucks or Trailers of a Water Level Capacity of 22.0 cu. yds. and over, Euclids and all Floats, Flatbed

Trailers, Boom Trucks, Winch Trucks, Including Small Trailers, Farm Wagons, Tilt Top Trailers, Tool Trailers, Concrete Pumps, Concrete Conveyors, Gasoline Tank Trailers, Truck Mounted Mobile Concrete Mixers, End Dump, Side Dump and Articulated Dump Trucks.

GROUP 4: Warehousemen.

\_\_\_\_\_\_

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

\_\_\_\_\_\_

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

-----

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

# WAGE DETERMINATION APPEALS PROCESS

- 1.) Has there been an initial decision in the matter? This can be:
- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour

MO030001 29 06/13/03

Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.

Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator U.S. Department of Labor 200 Constitution Avenue, N. W. Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board U. S. Department of Labor 200 Constitution Avenue, N. W. Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final. END OF GENERAL DECISION

MO030001 30 06/13/03

GENERAL DECISION M0030037 06/13/03 M037 General Decision Number M0030037

Superseded General Decision No. MO020037

State: Missouri

Construction Type:

RESIDENTIAL

County(ies):

JOHNSON LAFAYETTE PETTIS

RESIDENTIAL CONSTRUCTION PROJECTS consisting of single family homes and apartments up to and including 4 stories.

Modification Number Publication Date 0 06/13/2003

COUNTY(ies):

JOHNSON LAFAYETTE PETTIS

SUMO4015A 01/29/1990

	Rates	Fringes
BRICKLAYERS	11.025	2.15
CARPENTERS	8.53	
CEMENT MASONS	10.00	
ELECTRICIANS	7.89	
LABORERS	5.15	
PAINTERS:		
Brush	10.00	
Spray	11.00	
PLUMBERS	10.52	
POWER EQUIPMENT OPERATORS:		
Bulldozers	10.00	
Hi-Loaders	9.54	
ROOFERS	9.65	1.64
SHEET METAL WORKERS	8.93	
SOFT FLOOR LAYERS	7.79	
TILE SETTERS	9.32	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

-----

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

-----

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WAGE DETERMINATION APPEALS PROCESS

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Wage and Hour Administrator U.S. Department of Labor 200 Constitution Avenue, N. W. Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

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Administrative Review Board U. S. Department of Labor 200 Constitution Avenue, N. W. Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final. END OF GENERAL DECISION

# DIVISION 1 - GENERAL

01010	Summary of Work
01012	Design After Award
01015	Environmental Provisions
01100	General
01312A	Quality Control Systems (QCS)
01320A	Project Schedule
01330	Submittal Procedures
01356A	Storm Water Pollution Prevention Measures
01451A	Contractor Quality Control
01500A	Temporary Construction Facilities
01780A	Closeout Submittals

# **SECTION 01000**

# GENERAL DESIGN AND CONSTRUCTION REQUIREMENTS

## **INDEX**

- PART 1 DESIGN AND CONSTRUCTION OBJECTIVES
- PART 2 CRITERIA REFERENCES
- PART 3 CRITERIA FOR SUSTAINABLE DESIGN AND CONSTRUCTION
- PART 4 SITE PLANNING
- PART 5 SOILS AND SUBSURFACE CONDITIONS
- PART 6 GRADING, PAVING AND EROSION CONTROL
- PART 7 LANDSCAPE
- PART 8 SITE UTILITIES
- PART 9 HOUSING UNIT DESIGN/CONSTRUCTION
- PART 10 HOUSING UNIT STRUCTURAL DESIGN
- PART 11 HOUSING UNIT PLUMBING
- PART 12 MAJOR APPLIANCES
- PART 13 HOUSING UNIT HVAC
- PART 14 HOUSING UNIT ELECTRICAL

# PART 1 - DESIGN AND CONSTRUCTION OBJECTIVES

# **INDEX**

1	DESIGN	NAND CONSTRUCTION OBJECTIVES	2
	1.1 Scc	DPE OF WORK	2
	1.2 REQ	UIREMENTS AND DESCRIPTIONS OF WORK	3
	1.2.1	New Housing Units	
	1.2.2	Size Standards	
	1.2.3	Accessible Units	5
	1.2.4	Site Area	5
	1.2.5	Demolition	5
	1.2.6	Design Freedom	
	1.2.6.1	Housing Units	12
	1.2.6.2	2 Betterments	13
		CYCLED/RECYCLABLE MATERIALS	
		SIGN	
	1.5 Exa	AMPLES/QUALITY	14

# 1 DESIGN AND CONSTRUCTION OBJECTIVES

The design and construction of Family Housing Units under this Indefinite Delivery Indefinite Quantity (IDIQ) contract for Whiteman AFB, Missouri, shall comply with specifications and requirements contained in this Request for Offers (RFP). Landscaping shall conform to native type and low maintenance principals. Recreational features shall provide safe and modern focal areas for the neighborhoods. The design and technical criteria contained and cited in this RFP establishes minimum standards for design and construction quality except where maximum sizes are identified, such as for the housing unit gross floor area, and the number of housing units per building.

The major objectives for the project are:

- Provide maximum number of housing units, complete and adequate for assignment as quarters for military personnel with families, each unit at or above the Programming Benchmark for allowable gross square feet.
- 2) Provide not only the maximum number of complete units, each at or above the Programming Benchmark in size, but also provide all units with the maximum groupings of identified betterments.
- 3) Provide a Development Plan meeting or exceeding the goals stated here in Section 01000.
- 4) Provide a holistic approach to the design of both the site and the new housing units.

## 1.1 SCOPE OF WORK

Over the course of the multi-year project, design and construction requires the mixture of two, three, four and five bedroom units dispersed on Government-owned land at Whiteman AFB, MO. This contract will be effective for a base total of five years, with anticipation of demolition and replacement of 60 to 200 units per Task Order, and the potential for renovating some existing units. If exercised, an optional CLIN would extend the contract an additional five years.

The work of the first Task Order (FY 03) consists of the demolition of 62 existing units (typically duplex configuration; see photos attached to Part 1, herein) and construction of 92 new three bedroom units. The work of Option 1 (FY 04) consists of the demolition of an additional 100 existing units, and construction in another area of the Base of 90 new three bedroom and 10 new four bedroom units. The site for the housing to be construction under the first Task Order (FY 03) and under Option 1 (FY 04) will be made available to the Contractor upon award in accordance with requirements given elsewhere in this Solicitation. Refer to Part 4 for location of the new units.

The work covered by the solicitation consist of furnishing all design, labor, equipment and materials and in performing all operations in the demolition and construction of housing units, all in strict accordance with this solicitation and its criteria and drawings, subject to the terms and conditions of the contract, all at the Contractor's expense.

Refer to paragraph 1.2.5 for scope of demolition work.

# 1.2 REQUIREMENTS AND DESCRIPTIONS OF WORK

# 1.2.1 NEW HOUSING UNITS

In accordance with the guidelines and requirements in Section 01000, provide family housing units with attached garages, exterior storage within the garage, tornado "safe room" built in accordance with FEMA standards, individual central heating systems, energy conservation systems and central air conditioning, and including the following Contractor furnished/Contractor installed (CF/CI) equipment and appliances: refrigerators, garbage disposals, dishwashers, water heaters, range/ovens, range hoods, carbon monoxide detectors and smoke detectors. Occupant furnished/Occupant installed (OF/OI) equipment and appliances include the following: washers and dryers, freezers, microwave ovens, and automatic garage door openers. Family housing units shall be a mix to be determined by the Offeror of one-story and/or two-story structures configured as single units and duplexes to be determined by each Task Order and the Offeror based on available land and siting requirements. Family housing distribution for FY03, Task Order No. 1 and for FY04 Option shall be as shown in Table 1-1.

TABLE 1-1 - HOUSING UNITS			
Grade Categories	Number of Bedrooms	Number of Units	
		Demo <sup>1</sup> /New	
Task Order No.1 (FY03): E-1 through E-6 (JNCO)	3	62/92	
Option 1 (FY04): E-1 through E-6 (JNCO)	3	90/90	
Option 1 (FY04): E-1 through E-6 (JNCO)	4	10/10	
Option 2:	Not applicable	8/0	

**Note<sup>1</sup>:** All of the units that are to be demolished are in Duplex Buildings of between 1000 and 1400 sq. ft.; approximately 50% of the units to be demolished have basements, and the remainder have crawl spaces instead.

# 1.2.2 SIZE STANDARDS

Table 1-2 indicates the allowable size standards with regard to Gross Square Footage (GSF) for all potential dwelling units. Plan, program, and design all units to the Programming Benchmark or above. Offers can be accepted within the range shown, but it is the desire of the Base to construct each unit and each type of unit at or above the Programming Benchmark square footage. Design-Build submissions will be looked on more favorably when these desirable sizes can be met and offered within the given site density. The range allows the Design-Build Contractor some flexibility to achieve this goal.

**Table 1-2 Replacement and New Construction Size Standards** 

		REPLACEMENT & NEW CONSTRUCTION MINIMUM	PROGRAMMING BENCHMARK	REPLACEMENT & NEW CONSTRUCTION MAXIMUM
Grade categories	Bedrooms per category	GSF	GSF	GSF
	_			
	2	1180	1340	
E1-E3 (JENL)	3	1490	1630	
E4-E6 (JNCO)	4	1670	1950	2220
	5	1920	2300	2670
E7-E8 (SNCO)	2	1180	1490	1790
W1-W3 (WO)	3	1670	1860	2050
O1-O3 (CGO)	4	1800	2150	2500
	5	1920	2510	3000
E9 (SNCO)	3	1740	2020	2300
W4-W5 (WO)	4	1920	2310	2700
O4-O5 (FGO)				
	<u> </u>			
O6 (SO)	4	2110	2520	2920
07-010 (GO)	4	2600	3330	4060

# **GROSS SQUARE FEET (GSF) FLOOR AREA:**

All interior spaces (finished and unfinished) within the exterior faces of exterior walls and center line of party walls (in multiplex units) of housing units with the following areas of exclusion:

- -Carports and garages,
- -Exterior bulk storage (detached),
- -Trash enclosures (exterior),
- -Porches, open or closed, which are not heated or cooled and which retain the basic characteristic of a porch.
- -Terraces, patios, decks, balconies, and entrance stoops.

#### 1.2.3 ACCESSIBLE UNITS

Refer to Part 9 for requirements and standards of design and construction for exterior and interior accessibility. In Task Order No. 1 (FY03), five 3-bedroom units shall be single-story ground floor units with special accessibility features. In Option No. 1 (FY04) five 3-bedroom units shall be single story ground floor units with special accessibility features. Also in Option No. 1 (FY04), one or two 4-bedroom unit shall be single-story ground floor units with special accessibility features. Each of these five FY03 and six or seven FY04 units designated as accessible shall be designed and built in such a way that they may be easily and readily modified to accommodate physically challenged occupants at time of occupancy. Design of adaptable housing units shall conform to the Uniform Federal Accessibility Standards (UFAS) and American Disabilities Act (ADA). Adaptable housing units shall be well dispersed throughout the development and shall not be grouped or clustered so as to create segregated pockets within the housing community.

# 1.2.4 SITE AREA

The sites for FY03 and FY04 housing units are described in the Conceptual Land Use Map included in Part 4 and in the drawings included in the RFP. Site work under the Basic Items of this task order (FY03) includes all design and construction of the site design for the area of FY03 housing units, plus all design and construction of the site design for the connection of streets, trails, and utilities to and within this area. Site work under Option 1 (FY04) includes all design and construction of the site, design for the area of the FY04 housing units, plus all design and construction of the site design for the connection of streets, trails, and utilities to and within this area, plus all design and construction of the new controlled access perimeter fence. Refer to the Pricing Schedule in Section 00010. Also refer to Figure 1.2.4 "Options Diagram" at the end of Part 1. Work includes grading, storm drainage, erosion control, pedestrian and vehicular circulation, utility systems, outdoor lighting, play lots and physical security. Also refer to Section 02230 CLEARING AND GRUBBING included with this RFP.

# 1.2.5 DEMOLITION

a) Units to be removed by address are shown on the RFP drawings and are listed below.

62 units to be demolished as Basic Items (FY 03)					
C = site with identified chlore	("C" = site with identified chlordane contamination levels above the residential standard.)				
l		_			
Lakeside Neighborhood		Type			
813 -815 K	•	C-2			
814 -816 K	•	C-2			
817 -819 K	•	C-2			
818 -820 K	•	C-2			
821 -823 K	,	C-2			
822 -824 K	•	C-2			
825 -827 K	•	C-2			
842 -844 M	larshall	C-2			
846 -848 M	larshall	C-3			
0	18				
Midland Neighborhood					
147 -149 Ba	arksdale	M-4			
148 -150 Ba	arksdale	M-2			
C 151 -153 Ba	arksdale	M-2			
155 -157 Ba	arksdale	M-1			
156 -158 Ba	arksdale	M-4			
C 159 -161 B	arksdale	M-4			
C 160 -162 Ba	arksdale	M-2			
C 160 -162 Back C 163 -165 Back C	arksdale	M-1			
C 167 -169 B		M-2			
144 -146 El		M-1			
C 145 -147 E		M-1			
C 148 -150 E		M-1			
C 149 -151 E		M-2			
152 -154 El		M-1			
153 -157 El		M-2			
C 145 -147 Fo		M-2			
C 149 -151 Fo		M-1			
C 153 -155 Fo		M-1			
		M-4			
C 144 -146 M C 145 -147 M		M-1			
C 148 -150 M		M-2			
149 -151 M		M-2			
28	44	IVI-Z			
Woodside Neighborhood					
(None)					
0	0				
TOTALS					
	28 chlordane sites 62 units to be demolished				
	5= 31110 10 00				

# 100 units to be demolished as Option 1 (FY 04)

("C" = site with identified chlordane contamination levels above the residential standard.)

( C = ole with lagritude of the	ordano contamination	levels above the residential standard.)
Lakeview Neighborhood		Туре
802 -804	Atlas	C-2
803 -805	Atlas	C-2
810 -812	Chennault	C-2
814 -816	Chennault	C-2
818 -820	Chennault	C-2
822 -824	Chennault	C-2
826 -828	Chennault	C-3
830 -832	Chennault	C-3
807 -809	Marshall	C-3
811 -813	Marshall	C-3
815 -817	Marshall	C-2
819 -821	Marshall	C-2
823 -825	Marshall	C-2
826 -828	Marshall	C-2
827 -829	Marshall	C-3
830 -832	Marshall	C-2
831 -833	Marshall	C-2
834 -836	Marshall	C-2
835 -837	Marshall	C-2
838 -840	Marshall	C-2
839 -841	Marshall	C-2
850 -852	Marshall	C-3
854 -856	Marshall	C-3
857 -859	Marshall	C-2
858 -860	Marshall	C-2
811 -813	McGuire	C-3
812 -814	McGuire	C-2
815 -817		C-2
816 -818	McGuire	C-2
819 -821	McGuire	C-2
820 -822		C-3
823 -825		C-2
824 -826	McGuire	C-2
827 -829	McGuire	C-2
828 -830	McGuire	C-2
831 -833	McGuire	C-2
832 -834	McGuire	C-2
0	74	

Midland Neighborhood					
C 137 -1	39 Barksdale	M-1			
C 141 -1	43 Barksdale	M-2			
C 142 -1	44 Barksdale	M-2			
C 136 -1	38 Ellsworth	M-1			
137 -1	39 Ellsworth	M-1			
140 -1	42 Ellsworth	M-1			
C 141 -1	43 Ellsworth	M-1			
C 137 -1	39 Forbes	M-1			
C 137 -1 C 141 -1 C 136 -1 C 137 -1	43 Forbes	M-2			
C 136 -1	38 Minuteman	M-4			
C 137 -1	39 Minuteman	M-2			
C 140 -1	42 Minuteman	M-1			
C 141 -1	43 Minuteman	M-2			
22	26				
Woodside Neighborhood					
(None)					
0	0				
TOTALS	TOTALS				
22 chlordane sit	es 100 units to	be demolished			

8 units to be demolished as Option 2	
("C" = site with identified chlordane contamination levels above the residential standard.)	
Lakeside Neighborhood	<u>Туре</u>
(None)	
0	0
Midland Neighborhood	
(None)	
0	0
Woodside Neighborhood	
C 101 -103 March	M-6
C 105 -107 March	M-8
111 -113 March	M-6
C 117 -119 March	M-8
6	8
TOTALS	
6 chlordane sites	8 units to be demolished

b) Demolition shall consist of the complete removal of the structure, including the foundation and associated infrastructure. See Section 02220 DEMOLITION included herewith. The Contractor is responsible for coordinating the utilities to insure that there is minimal disruption of power, telephone, and cable TV service to the surrounding areas. Any disruption of service shall be limited to normal daylight hours. Number and duration of service outages shall be scheduled so as to minimize disruption to surrounding areas and to family housing occupants.

Outage schedules and requirements shall be per the Utility Outage paragraph of Section 01100 of this RFP.

- A sampling of the housing units to be demolished have been surveyed for asbestos. c) lead-based paint, and chlordane. Units with chlordane contamination levels above the residential standard are listed above. The Contractor shall assume that 50% of the chlordane contaminated soil will need to be trucked to a stockpile on Base, while 50% of the such soil will be replaced in situ. The Contractor shall remove and dispose of all asbestos and lead paint. The Contractor shall be responsible for locating disposal facilities, which will accept solid waste containing lead-based paint. No such waste areas exist on the Base, nor are there any Government controlled waste sites in the general vicinity. There are no controlled waste areas on the Base for the disposal of ACM. For floor tile containing asbestos, the Offer should assume an average of 4 layers of floor tile will need to be removed to an acceptable waste facility off Base. even though not all of the 4 layers of floor tile may contain asbestos. See Attachments for Asbestos and Lead Paint Reports for the typical location of asbestos and leadbased paint in the housing units. See Sections 13780 ASBESTOS ABATEMENT and 13281 LEAD HAZARD CONTROL ACTIVITIES (both included herewith) for demolition requirements related to structures containing lead-based paint and/or asbestos. [Note: Attached herewith is an Asbestos/Fungal/Lead Paint & Soil Testing Report from investigations done in 2003 on seven housing units in structures scheduled to be demolished under this RFP. Also included in this 2003 report is one unit of similar construction, condition, and location to the ones scheduled to be demolished under this RFP. Several similar investigations have been conducted in the past for hazardous environmental conditions in Base family housing. The Government used the "sampling" method to verify that these conditions existed in the type, condition, and location of the housing units scheduled to be demolished under this RFP. As an additional information resource, Offerors may refer to the attached Asbestos & Lead Paint Report from investigations done in May 2002 on similar structures being demolished under an earlier, separate contract.]
- d) All demolition areas identified in the RFP are in areas that will contain new replacement housing to be authorized by future task orders. Offerors shall clearly depict demolition phasing in the schedule submitted with the Offer. Demolition work shall be phased as follows:
  - D-03-1: Of the 62 units included as Basic Items (FY 03), abate and demolish the 44 units in the Midland Neighborhood starting no earlier than 30 March 2004 with completion and site restoration accomplished no later than 30 June 2004.
  - D-03-2: Abate and demolish the remaining 18 units included as Basic Items (FY 03) based upon phasing plans approved by the Contracting Officer. Units and their sites shall be abated and demolished, and have their sites restored, no later than 60 days following the acceptance of a like number of new units from the Contractor, but not prior to acceptance of one new access road connection to the new FY 03 housing area.
  - D-04-1: Abate and demolish Option 1 and Option 2 units, and have their sites restored, no later than 60 days following the acceptance of a like number of new units from the Contractor. Demolition work under either option can not start until that option has been authorized.
- e) The portion of the below grade utility lines (laterals), including water/gas/sanitary and storm sewer, serving the existing family housing units to be demolished and not required for maintaining facilities unaffected by FY03 construction, shall be removed to the main at the existing streets.

- f) Existing wyes on sanitary sewer mains shall be left in place and capped.
- **g**) Contractor shall demolish utilities mindful of the re-use of existing service taps and valves where feasible. Cap existing tap if at a tee.
- h) The removal and relocation of the communication lines and equipment shall be coordinated with SBC Communications, (point of contact David Brown, Phone: 660-826-9853), who shall do the actual demolition work; however, the Contractor is financially responsible for the demolition. The Contractor shall allow SBC to remove and salvage any and all of their desired equipment. The Contractor shall remove and dispose of all unsalvaged communication lines and equipment owned by SBC Communications, clean up the disturbed area, and restore it to the condition that was existing prior to the work.
- The Contractor shall coordinate with Whiteman AFB and SBC Communications prior to demolition of the communication lines.
- j) The removal and relocation of the cable TV lines and equipment shall be coordinated with Charter Communications, Inc., (point of contact Terry Fuller, Phone: 660-563-3636). The Contractor shall do the actual demolition work; however, Charter Communications, Inc. shall be allowed to remove and salvage any and all of their desired equipment. The Contractor shall remove and dispose of all unsalvaged cable TV lines and equipment owned by Charter Communications, Inc.
- k) The removal of the branch power lines and equipment shall be coordinated with the Whiteman Base Civil Engineering Office. The Contractor shall do the actual work; however, the Whiteman BCE shall be allowed to remove and salvage any and all of their desired equipment at a time which does not delay the Contractor. The Contractor shall remove and dispose of all unsalvaged power lines and equipment owned by Whiteman Air Force Base.
- Existing streets, curbs, gutters, and sidewalks shall remain. Existing driveways, patios, miscellaneous slabs, electrical lines and equipment, and fences shall be removed.
- m) Prior to turning the units to be demolished over to the contractor, the Government will salvage some equipment in each of the units. Title to material and equipment to be demolished, except Government salvage, is vested in the contractor upon receipt of notice to proceed with demolition. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.
- n) Contractor shall salvage recoverable items and material to the maximum extent possible. However, contractor shall assume no salvage value or compensation in the Offer. Salvage material recovered by the contractor shall be removed from Government property. Refer to Part 3 for waste management criteria and for recycling and re-use facilities available.
- o) Photos of typical existing housing unit types to be removed are shown below:



Typical M-1 Unit without Basement



Typical M-1 Unit without Basement



Typical M-2 Unit without Basement



Typical C-2 Unit with Basement



Typical C-3 Unit with Basement



Typical C-3 Unit with Basement

# 1.2.6 DESIGN FREEDOM

Innovative, creative, or cost-saving offers that meet or exceed the minimum requirements (maximum requirements cannot be exceeded) are encouraged and will receive more favorable rating accordingly. Existing housing plans or modifications thereof that meet the design and construction criteria specified herein, which an Offeror has previously constructed and priced, may be submitted. They may include designs incorporating factory-fabricated components or modules. Deviations from space and adjacency

requirements are discouraged unless the changes result in improvement to the facilities. Sections which do include products by reference to industry standards or particular type are intended to demonstrate the Government's minimum need in that area of work. Where minimum housing unit standards are not indicated in the RFP, the guidelines provided in the Air Force Family Housing Guide (December 1995) define the minimum acceptable standards and the objectives to be met.

## 1.2.6.1 Housing Units

All replacement units under this RFP shall be built in either single-family or duplex configuration. A duplex is defined as a one to two-story building, housing 2 dwelling units joined together by a common party wall and each dwelling unit entered separately and directly from the exterior. A single unit is defined as a one- or two-story building, housing one dwelling unit separate from any other dwelling unit.

- a) Site-built, factory-built, and manufactured housing units are acceptable options for this project if all requirements specified in this RFP are met. Definitions for acceptable type construction practice for duplex housing units under this RFP are as follows:
  - Site-built housing. A residential building or housing unit wholly or substantially constructed at the site.
  - (2) Factory-Built Housing: Construction consisting of components, sub-assemblies such as modules, panelized walls, roof trusses, floor joists, and other factory-assembled components, which are transported to the construction site and further assembled into completed housing units. All interior and exterior walls, regardless of whether they are structural (load bearing) or not, are plant fabricated (panelized). Panels must be fabricated to the extent that the structure of the panel or truss is factory-assembled. Interior finishes, such as interior wallboard shall be site applied.
  - (3) Manufactured housing: A manufactured home is "a structure, transportable in one (1) or more sections, and when erected on site, is built on a permanent foundation and has connected utilities, which includes the plumbing, heating, air conditioning and electrical systems contained therein."
- c) The design quality objective is to obtain housing structures and complimentary site development within the funds available while optimizing livability. Design quality is achieved through the optimization of interior planning, integration of housing structures to the site, and balancing architectural attractiveness, variety, function, and design for low-cost maintenance and operation.
  - (1) Items included by the Offeror, which exceed the RFP minimum requirements will affect positively the rating of the presentation. Items submitted in the successful Offeror's initial offer shall not be substituted for without written acceptance by the Contracting Officer. Items, if substituted, must in all cases maintain, match or exceed the standards set forth in the RFP.
- d) Ecological Benefits and Energy and Resources Conserving Features: Public Law 102-486, as well as, Executive Order 12902, require Federal buildings to be designed and constructed to reduce energy consumption in a life-cycle, cost-effective manner using renewable energy sources when economical. Products designed to conserve energy and resources by controlling the amounts of consumed energy or by operating at increased efficiencies should be considered. Refer to Part 3 for ecological and sustainability criteria to be followed.
- e) Prototype Housing Units: The purpose of the prototype-housing unit is to verify the details of the approved design and material selections, and to establish the quality level against which the remaining work will be judged. At the plant, or at the site, construction connection details

shall be exposed for study by authorized Government inspectors for a period of time agreed to by the Contractor and the Contracting Officer. The housing unit or units at the plant and/or the prototype at the site are subject to Contracting Officer's approval. At the site, the complete prototype shall be constructed for each housing unit type. Each stage of work shall be completed and accepted on the prototype, prior to starting work on the same stage for similar housing units in the project. See Section 01100 for typical items for inspection and approval.

- (1) "Site-Built": A prototype-housing unit shall be required for each housing unit type.
- (2) "Manufactured" or "Factory-Built": A prototype-housing unit shall be required for each housing unit type of each run fabricated at the plant for manufactured or factory-built homes.
- f) Manufactured: If the housing units are classified as manufactured housing, all interior and exterior systems which form integral parts of the transportable module shall be constructed and assembled for inspection by the Government. This shall include, as a minimum, wall and ceiling construction, interior finishes, utility piping, wiring, and ductwork fastening and assembling of adjacent modules, connection details to sinks, installed kitchen cabinets and countertops. Portions of the work shall be left unfinished or exposed to demonstrate interior construction details.
- g) Factory-Built: If the housing units are classified as factory-built housing, all wall panels which are fabricated in the plant for shipment to the site shall have prototype units constructed and assembled for in-plant inspection by the Government. This shall include, as a minimum, wall framing, roof and ceiling framing, connection details, utility piping, wiring and ductwork, interior and exterior wall finishes which form part of the factory-built wall. In addition, the Contractor shall construct as part of the factory-built prototype, installed samples of wall insulation, finished siding (if not part of wall assembly), sample installed bathtub and sink and installed kitchen sink and cabinets to demonstrate proper installation and wall connections. Portions of the work shall be left unfinished or exposed to demonstrate interior construction details.
- h) One-Floor-Prototype: If only one floor of the prototype is manufactured or factory-built, factory assembly of the manufactured or factory-built portion of the prototype is required. In all cases, the factory prototype shall consist of one of each building type. The factory prototype shall be assembled to verify assembly connections, details, construction, and transportation of the finished housing unit.
- i) Structural Integrity: Manufactured and factory-built homes shall be of individual housing units attached to one another in a manner which shall provide a finished structural assembly having an appearance and structural integrity comparable to a site-built single or multi-family residence built to applicable codes.
- j) Construction Tolerances: Assembled housing units shall be true and plumb and all within specified construction tolerances for all alignments represented on the drawings. Adjacent walls shall be attached at roof and floor levels in such a manner as to preclude placing any wood member in cross-grain bending or cross-grain tension, and to avoid putting nails in withdrawal.

#### 1.2.6.2 Betterments

The government's preferences regarding "betterments" are as follows:

## First priority for "betterments"

Heavy-duty plastic laminate flooring for front entry, living, and dining areas (in all units provided).

## Second priority grouping for "betterments" with no priority within grouping

First floor ceiling heights of 9 feet or greater, measured as the average vertical dimension of the walls from the intersection with the floor to the intersection with the ceiling (in more than 50% of units provided).

Dual access to mechanical rooms both from outside the unit and from inside the unit or garage (in more than 50% of units provided).

Construct front stoops and patios with patterned and colored concrete (at all units provided).

## Third priority grouping for "betterments" with no priority within grouping

Zoned HVAC for all two-story units.

Masonry veneer over at least 50% of the building's exterior (in at least 33% of units provided).

Garage personnel door (in all units provided).

Increase Master Bedroom closet space by 25% over minimums stated in AFFHG (in all units provided).

Solid surfacing kitchen countertops with integral back-splash, and with integral double-bowl sink (in all units provided).

Laundry sink in a base cabinet (in more than 50% of units provided).

Provide sidewalks – or a portion of the trail system – on both sides of residential streets (in front of all units provided) rather than on just one side.

Place garages having overhead doors facing the Community Zone at least 20 feet beyond the front building line, OR provide side or rear entry garages, thereby allowing the driveway paving width in the Streetscape Zone to be minimized (in at least 33% of the units provided).

Garage door openers installed, instead of occupant furnished and installed (in all units provided). Paint interior walls and ceilings of garages (in all units provided).

The Government prefers that "betterments" be uniform between Basic Items (FY03) and Option 1 (FY04). "Betterments" proposed by the Offeror will also be considered. Nevertheless, the government's priorities are as listed above. Because "betterments" included with the offer become part of the basis for award, they can not be changed without the expressed approval of the Contracting Officer. Refer to section 00110 PROPOSAL SUBMISSION AND EVALUATION for requirements for reporting "betterments" as part of the Offerer's "Tab 7" and "Tab 8", and as part of Volume III-PRICE.

## 1.3 RECYCLED/RECYCLABLE MATERIALS

Executive Order 13101, Greening of the Government Through Waste Prevention, Recycling, and Federal Acquisition, addresses federal design construction requirements for the use of recycled ("environmentally preferable") materials. Included within this EO is the responsibility to make wise choices relative to life cycle cost, recyclability, and waste prevention. Refer to Part 3 for waste management criteria including recycling and re-use facilities available.

## 1.4 DESIGN

After contract award and upon receipt of Notice to Proceed, the Contractor shall prepare detailed project design documents in accordance with SECTION 01332, SUBMITTALS DURING DESIGN. The submittal shall be suitable for adequate demonstration of the design, materials and methods of construction in accordance with the contract.

## 1.5 EXAMPLES/QUALITY

Building systems, materials, and methods specified herein are defined as the minimum salient features desired and preferred for a level of quality, standards and compatibility throughout. Any appropriate building systems, operational equipment, materials, and methods that meet or exceed the standards and

compatibility requirements set forth in the RFP may be proposed by the Design/Build Team. These shall be clearly specified within the offer as "betterments." Refer to Section 00110 PROPOSAL SUBMISSION AND EVALUATION for requirements for reporting "betterments".

Refer to the attached images for both desirable and undesirable housing appearances. The government desires for the Offeror to provide housing with a variety of appearances while also providing compatibility within a particular neighborhood. Between adjacent neighborhoods, variety is particularly important. Refer to Part 4 for additional criteria regarding variety of appearances.

1A

 Scale and proportion of roof and hierarchy of house elements (ie: garage is too important).

- Windows are centered over garage, not in relationship with façade design.

Windows in proportion to wall.-



Material change at outside corner.

Inappropriate and inconsistent roof—combination (gable and hip).

- Inappropriate proportion of roof to columns and column height.

proportion.

1C

Material change at outside corner.



window in the wall.

1D



Column proportion to height.



Resolution of function and\_\_\_\_\_detail of downspout

2C



Improper proportion of base to column.

Columns and fireplace appear to be unsupported.

2B

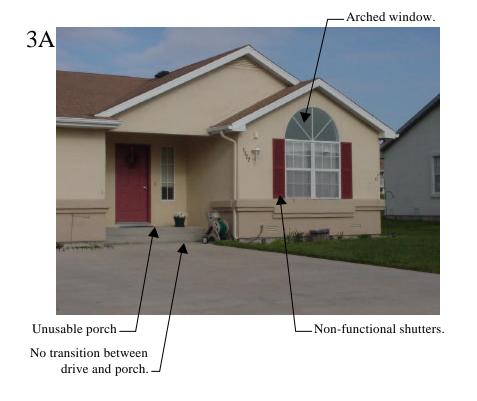


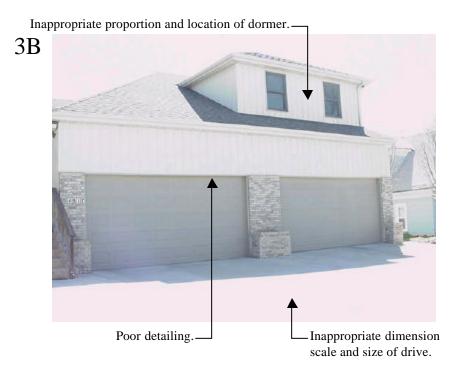
Material change at—outside corner.

Inappropriate dormer proportions: fascia, window and trim.

2D









Good proportions of roofs, porch, porch columns, and windows.



Good detailing of porch and windows.

Overall good proportions.



Simple porch roof attached to main body of house.

Overall good proportions



Good integration of roof planes.

Good porch detailing, especially at porch and corner columns.



Appropriate roof pitches and overhangs between house, dormer and porch.

Good material detailing and window placement.

2B



-Careful detailing of gable ends and returns.

2**C** 



Detailing appropriate to materials.

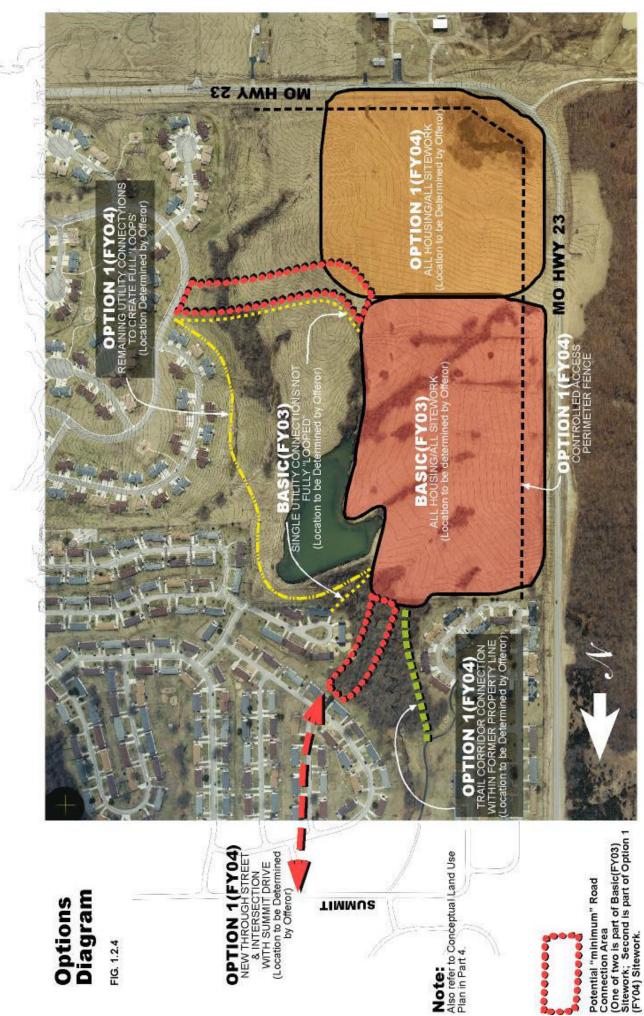
2D



Good proportions, materials and detailing.



Well proportioned porch, entry, roof steps, door and columns.



20000000

# Diagram Options

FIG. 1.2.4



## <u>PART 2 – CRITERIA REFERENCES</u>

## **INDEX**

PART	2 – CRITERIA REFERENCES	1
INDEX	ζ	1
2 CI	RITERIA REFERENCES	2
2.1	LOCAL STANDARDS	2
2.2	FEDERAL LAWS	
2.3	FEDERAL HANDBOOKS AND STANDARDS	
2.4	ADDITIONAL GOVERNMENT DOCUMENTS AND PUBLICATIONS	3
2.5	NON-GOVERNMENT PUBLICATIONS	4

## 2 CRITERIA REFERENCES

Criteria to be used for design and construction shall be taken from the most current references at the date of issue of the RFP. Administrative, contractual, and procedural features of the contract shall be as described in other sections of the RFP. Referenced codes and standards herein and those listed below are minimum acceptable criteria.

## 2.1 LOCAL STANDARDS

The following specifications, standards, bulletins, and handbooks form a part of this document to the extent specified herein. Unless otherwise indicated, copies are available at the following Web Site: http://www.hudclips.org/sub\_nonhud/cgi/hudclips.cgi

HUD MPS 4910.0	Site Design
HUD MPS 4940.2	Water Supply
HUD MPS 4940.3	Sanitary Sewer
HUD MAP 4930.1	Storm Drainage
HUD MAP 4930.1	Grading

## 2.2 FEDERAL LAWS

The Federal laws and regulations listed in Table 2-1 form a part of this document. They are available from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325 (202) 783-3238.

	TABLE 2-1 - FEDERAL LAWS & REGULATIONS		
CFR/USC No.	Description		
P.L. 102-486	Energy Policy Act of 1992		
10 CFR 430	National Appliance Energy Conservation Act (NAECA)		
10 CFR 436	Methodology and Procedures for Life Cycle Cost Analyses		
16 CFR 1630	Standard for Surface Flammability of Carpet and Rugs		
49 CFR 192	Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards		
7 USC 136	Insecticides and Environmental Pesticide Control		
10 USC 2826	Public Law 97-214, Military Construction and Military Family Housing		

,	TABLE 2-1 - FEDERAL LAWS & REGULATIONS	
CFR/USC No.	Description	
24 USC 5301	Public Law 93-383, Community Development	
42 USC 4321-4361	National Environmental Policy Act (NEPA)	
42 USC 4901-4918 & 49 USC 1431	Noise Control Act of 1972	
42 USC 5401-5426	Federal Manufactured Housing Construction and Safety Standards Act of 1974	
Army Regulation 200-1	Environmental Protection and Enhancement, May 1990	
E.O. 12902	<b>Energy Efficiency and Water Conservation in Federal Facilities</b>	

## 2.3 FEDERAL HANDBOOKS AND STANDARDS

The specifications listed form a part of this document to the extent specified herein. Federal Standard 795, Uniform Federal Accessibility Standards, and federal specifications are available from the Commanding Officer, Naval Publications and Forms Center, ATTENTION: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

## a) HANDBOOKS

	AFI	Air Force Instruction 32-6002, Family Housing Planning, Programming, Design, and Construction, 12 May 1994.
	AFFHG 32-6002.	Air Force Family Housing Guide, December 1995. Supplement to AFI
	TI 800-01	Technical Instructions Design Criteria, July 1998.
	TI 800-03	Technical Requirements for Design Build, July 1998.
b)	STANDARDS	
	FED-STD-795	Uniform Federal Accessibility Standards.
	ADAAG	Americans with Disabilities Act Accessibility Guidelines.

## 2.4 ADDITIONAL GOVERNMENT DOCUMENTS AND PUBLICATIONS

The following Government documents and publications form a part of this document to the extent specified herein:

- a) NBS Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program. Available from the National Institute of Science and Technology, formerly National Bureau of Standards (NBS).
- b) The following United States Environmental Protection Agency criteria are available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4650: EPA/600/8-88/087, Radon-Resistant Residential New Construction; EPA/625/5-88/024, Application of Radon Reduction Methods; and EPA/625/5-87/019, Radon Reduction Techniques for Detached Houses.
- c) Federal Emergency Management Agency (FEMA) Mitigation Directorate provides "Taking Shelter From the Storm: Building a Safe Room Inside Your House," FEMA Publication 320, available at the <a href="http://www.fema.gov/fima/tsfs02.shtm">http://www.fema.gov/fima/tsfs02.shtm</a> website.
- d) Missouri Code of State Regulations: 10 CSR 20-8.120 Design of Sewer.

## 2.5 NON-GOVERNMENT PUBLICATIONS

The following publications form a part of this document to the extent specified herein. Other portions of Section 01000 include reference to additional publications in addition to these; such referenced publications also from a part of this document to the extent specified in this Section. Unless otherwise specified, the issues of the documents which are Department of Defense (DoD) adopted are those listed in the Department of Defense Index of Specifications and Standards (DODISS).

- a) Air-Conditioning and Refrigeration Institute (ARI). Information listed below is available from ARI, 1501 Wilson Boulevard, Suite 600, Arlington, VA 22209, (703) 524-8800: (Unnumbered), Directory of Certified Unitary Air Conditioners, Unitary Heat Pumps and Sound Rated Outdoor Unitary Equipment; ARI 210/240, Unitary Air Conditioning and Air-Source Heat Pump Equipment.
- b) Air Movement and Control Association, Inc. (AMCA). AMCA 210, Laboratory Methods of Testing Fans For Rating, is available from AMCA, 30 West University Drive, Arlington Heights, IL 60004, (312) 394-0150.
- c) Home Ventilating Institute (HVI): a Division of AMCA. Copies of HVI publications are available at the following Web Site: http://www.lakehurst.com/hvihome.html or at (847) 394-0150.
- **d)** American Architectural Manufacturers Association (AAMA). AAMA specifications shown in Table 2-2 are available from AAMA, 2700 River Road, Suite 118, Des Plaines, IL 60018, (312) 699-7310.

TABLE 2-2 - AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION SPECIFICATIONS	
No.	Description
AAMA 101	Voluntary Specification for Aluminum Prime Windows and Sliding Glass Doors
AAMA 101V	Voluntary Specification for Poly (Vinyl Chloride) (PVC) Prime Windows and Sliding Glass Doors

TABLE 2-2 - AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION SPECIFICATIONS	
No.	Description
AAMA 1002.10	Voluntary Specifications for Aluminum Insulating Storm Products for Windows and Sliding Glass Doors
AAMA 1402	Standard Specifications for Aluminum Siding, Soffit, and Fascia

- e) American Gas Association (AGA). Standards and specifications are available from AGA, 1515 Wilson Boulevard, Arlington, VA 22209, (703) 841-8400.
- f) American National Standards Institute, Inc. (ANSI). Copies of the standards listed in Table 2-3 are available from ANSI, 1430 Broadway, New York, NY 10018, (212) 354-3300.
- g) Residential Streets, Third Edition, Walter Kulash Principle Author, Urban Land Institute, National Association of Home Builders, American Society of Civil Engineers, Institute of Transportation Engineers (2001). Institute of Transportation Engineers, 1099 14<sup>th</sup> Street, NW, Suite 300 West, Washington, D.C. 20005-3438, (202) 289-0222. (only for background on principles and techniques of neighborhood street design.)
- h) Traditional Neighborhood Development Street Design Guidelines, A Recommended Practice of the Institute of Transportation Engineers, (October 1999). Institute of Transportation Engineers, 1099 14<sup>th</sup> Street, NW, Suite 300 West, Washington, D.C. 20005-3438, (202) 289-0222. (only for background on principles and techniques of neighborhood street design.)

TABLE 2-3 - AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS	
Std. No.	Std. Description
A112.19.1	Enameled Cast Iron Plumbing Fixtures
A112.19.2	Vitreous China Plumbing Fixtures
A112.19.3	Stainless Steel Plumbing Fixtures (Designed for Residential Use)
A112.19.4	Porcelain Enameled Formed Steel Plumbing Fixtures
A112.19.5	Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards) (DoD Adopted)
A137.1	Specification for Ceramic Tile
A161.1	Recommended Construction and Performance Standards for Kitchen and Vanity Cabinets
B16.5	Steel Pipe Flanges and Flanged Fittings
B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

TABLE 2-3	TABLE 2-3 - AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS	
Std. No.	Std. Description	
	(DoD Adopted)	
B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes	
B31.8	Gas Transmission and Distribution Piping Systems	
B36.10	Seamless & welded steel pipe	
C2	National Electrical Safety Code	
ANSI C105 AWWA A21.5	Polyethylene Encasement for Ductile-Iron Pipe Systems	
Z21.10.1	Water Heaters, Gas, Volume I, Storage Type, 75,000 BTUH Input or Less	
Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances	
Z60.1	American Standard for Nursery Stock	
Z124.1	Plastic Bathtub Units	
Z124.2	Plastic Shower Receptors and Shower Stalls	

- i) American Plywood Association. APA B840-K-88, 303 Siding Manufacturing Specifications, are available from the American Plywood Association, P.O. Box 11700, Takoma, WA 98411, (206) 565-6600.
- j) American Public Works Association (APWA), Kansas City Metropolitan Chapter. Specifications listed below are available from the following Web site: http://www.kcapwa.net/docs/Spec Order Form.pdf. APWA Section 5601.8A, APWA Section 5606
- **k**) American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) documents, listed in Table 2-4, are available from ASHRAE, 1791 Tullie Circle, N.E., Atlanta, GA 30329, (404) 636-8400.

TABLE 2-4 - AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR-CONDITIONING ENGINEERS (ASHRAE)	
No.	Description
ASHRAE -	Handbook of Fundamentals

TABLE 2-4	TABLE 2-4 - AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR-CONDITIONING ENGINEERS (ASHRAE)	
No.	Description	
ASHRAE -	Residential Cooling Load Calculations	
ASHRAE 52	Method of Testing Air Cleaning Devices used in General Ventilation for Removing Particulate Matter	
ASHRAE 90A	Energy Conservation in New Building Design	
ASHRAE 90.2P	Energy Efficient Design of New Low-Rise Residential Building	
ASHRAE 111	Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air Conditioning, and Refrigeration Systems	

- I) American Society of Mechanical Engineers (ASME). ASME B16.11, Forged Fittings, Socket-Welding and Threaded is available from ASME, 345 East 47th Street, New York, NY 10017, (212) 705-7722.
- m) American Society of Sanitary Engineers (ASSE). ASSE 1006, Residential Use (Household) Dishwashers, and ASSE 1008, Food Waste Disposal Units, Household, are available from ASSE, P.O. Box 40362, Bay Village, OH 44140.
- n) American Society for Testing and Materials (ASTM). ASTM specifications listed in Table 2-5 are available from ASTM, 1916 Race Street, Philadelphia, PA 19103, (215) 299-5400.

TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS		
Spec. No.	Spec. Description	
A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamle	
A185	Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement	
A497	Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement	
A526	Specification for Steel Sheet Zinc-Coated (Galvanized) by the Hot-I Process, Commercial Quality (DoD Adopted)	
A615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement	

TABLE 2-5	AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS	
Spec. No.	Spec. Description	
B117	Method of Salt Spray (Fog) Testing (DoD Adopted)	
C33	Specification for Concrete Aggregates	
C40	Organic Impurities in Fine Aggregates for Concrete	
C90	Specification for Hollow Load-Bearing Concrete Masonry Units (DoD Adopted)	
C94	Specification for Ready-Mixed Concrete	
C150	Specification for Portland Cement	
C216	Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale) (DoD Adopted)	
C260	Specification for Air-Entraining Admixtures for Concrete	
C294	Standard Descriptive Nomenclature for Constituents of Concrete Aggregates	
C309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete	
C618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete	
C828	Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines	
C924	Standard Practice for Testing Concrete Pipe Sewer Lines by Low- Pressure Air Test Method	
D422	Standard Test Method for Particle-Size Analysis of Soils	
D977	Standard Specification for Emulsified Asphalt	
D1335	Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings	
D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)	
D1586	Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils	
D1587	Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes	
D2027	Standard Specification for Cutback Asphalt (Medium-Curing Type)	

TABLE 2-5 - A	MERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS
Spec. No.	Spec. Description
D2166	Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
D2435	Standard Test Method for One-Dimensional Consolidation Properties of Soils
D2487	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
D2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
D3462	Specification for Asphalt Shingles Made from Glass Felt and Surfaced With Mineral Granules
D3676	Rubber Cellular Cushion Used for Carpet or Rug Underlay
D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft 2700kN-m/m)
D1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 (DoD Adopted)
D2513	Standard Specification for Thermoplastic Gas Pressure Piping (DoD Adopted)
D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing (DoD Adopted)
D2846	Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold-Water Distribution Systems (DoD Adopted)
D3018	Specification for Class A Asphalt Shingles Surfaced with Mineral Granules (DoD Adopted)
D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
D4546	Standard Test Methods for One-Dimensional Swell or Settlement Potential of Cohesive Soils
D5079	Standard Practices for Preserving and Transporting Rock Core Samples
E84	Standard Test Method for Surface Burning Characteristics of Building Materials (DoD Adopted)
E90	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions (DoD Adopted))
E108	Standard Methods of Fire Tests of Roof Coverings
L	

<b>TABLE 2-5 -</b>	AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS	
Spec. No.	Spec. Description	
E119	Standard Methods of Fire Tests of Building Construction and Materials	
E162	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source (DoD Adopted)	
E283	Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors	
E330	Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference	
E336	Standard Test Method for Measurement of Airborne Sound Insulation in Buildings	
E547	Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential	
E648	Critical Radiant Flux of Floor-Covering Systems Using a Radiant Energy Source	
E779	Measuring Air Leakage by the Pressurization Method	
E1007	Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures	
E1465	Standard Guide for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings	
F964	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Exterior Profiles Used for Fencing	
F1292	Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment	
E1423	Standard Practice for Determining the Steady State Thermal Transmittance of Fenestration Systems	
E1554-94	Standard Test Methods for Determining External Air Leakage of Ai Distribution Systems by Fan Pressurization	
F1303	Specification for Sheet Vinyl Flooring with Backing	
F1487-93	Standard Consumer Safety Performance Specification for Playgroun Equipment for Public Use	
F1951	Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment	
F2075	Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground	

TABLE 2-5	TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS		
Spec. No.	Spec. Description		
	Equipment		
G51	Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing		
G57	Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method		
G90	Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight		

- o) American Water Works Association, Inc. (AWWA). Specifications listed below are available from AWWA, 6666 Quincy Ave., Denver, CO 80235, (303) 794-7711: AWWA C500, Gate Valves for Water and Sewerage Systems (DoD adopted); AWWA C502, Dry-Barrel Fire Hydrants; AWWA C503, Wet-Barrel Fire Hydrants, AWWA C651, Disenfecting Water Mains, AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances, and AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inch thru 12 inch.
- p) Associated Air Balance Council (AABC). AABC MN-1, National Standards for Total System Balance, is available from AABC, 1518 K Street N.W., Washington, DC 20005.
- q) Association of Textile Chemists and Colorists (AATCC). AATCC 134, Electrostatic Propensity of Carpets, is available from AATCC, P.O. Box 12215, Research Triangle Park, NC 27709, (919) 549-8141.
- r) Builders Hardware Manufacturers Association, Inc. (BHMA). Specifications shown in Table 2-6 are available from the Builders Hardware Manufacturers Association, Inc. (BHMA), 60 East 42nd Street, Room 511, New York, NY 10165, (212) 661-4261.

TABLE 2-6 - BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA) SPECIFICATIONS		
No.	Description	
BHMA 101	Butts and Hinges	
BHMA 301	Door Controls, Closers	
BHMA 501	Auxiliary Locks and Associated Products	
BHMA 601	Bored and Preassembled Locks and Latches	
BHMA 611	Interconnected Locks and Latches	
BHMA A156.4	Door Controls - Closers	

TABLE 2-6 - BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA) SPECIFICATIONS	
No.	Description
BHMA A156-5	Interchangeable Cores

- s) Electronic Industries Association Telecommunications Industry Association (EIA/TIA). EIA/TIA Standard EIA/TIA-570, is available from Electronic Industries Association, Engineering Department, 2001 Pennsylvania Ave., N.W., Washington, DC 20006. Telephone: (202) 457-4966.
- t) Illuminating Engineering Society of North America (IESNA). The IESNA Lighting Handbook, is available from Illuminating Engineering Society of North America, 345 East 47th Street, New York, NY 10017.
- u) International Association of Plumbing and Mechanical Officials (IAMPO). The Uniform Plumbing Code and Uniform Mechanical Code is available from the International Association of Plumbing and Mechanical Officials (IAMPO) 5032 Alhambra Avenue, Los Angeles, CA 90032 / (213 223-1471).
- v) International Code Council (ICC) is available from the International Conference of Building Officials (ICBO), 5360 South Workman Mill Road, Whittier, CA 90601-2298. Telephone: (800) 284-4406.

2000 International Building Code (IBC)

2000 International Mechanical Code (IMC)

2000 International Plumbing Code (IPC)

2000 International Residential Code for One and Two Family Dwellings (IRC)

- w) Missouri Department of Transportation (MoDOT). Standard Specifications and Details are available at the following Web site: http://www.modot.state.mo.us/design/stdplan/stdplan.htm or at 600 NE Colburn Road Lee's Summit, MO 64064 Telephone: (888)-ASK-MODOT
- x) National Association of Architectural Metal Manufacturers Association (NAAMA). NAAMA Metal Finishes Manual, is available from the National Association of Architectural Metal Manufacturers Association (NAAMA), 600 South Federal Street, Chicago, IL 60605-1842, (312) 922-6222.
- y) National Association of Corrosion Engineers (NACE). NACE RP-0286, The Electrical Isolation of Cathodically Protected Pipelines, is available from NACE, P.O. Box 218340, Houston, TX 77218.
- z) National Association of Corrosion Engineers (NACE). NACE RP-0169, Control of External Corrosion on Underground or Submerged Metallic Piping Systems, is available from NACE, P.O. Box 218340, Houston, TX 77218.
- aa) National Association of Plumbing-Heating-Cooling Contractors (PHCC). The National Standard Plumbing Code is available from National Association of Plumbing-Heating-Cooling Contractors (PHCC), P.O. Box 6808, Falls Church, VA 22046-1148, 1-800-253-4491.

- bb) National Earthquake Hazard Reduction Program (NEHRP). Provisions for New Buildings and Other Structures.
- cc) National Electrical Manufacturers Association (NEMA). NEMA standards listed below are available from the National Electrical Manufacturers Association (NEMA), 2101 L Street, N.W., Washington, DC 20037, (202) 457-8400: NEMA DC 3, Wall-Mounted Room Thermostats; and NEMA WD1, General Requirements for Wiring Devices.
- **dd**) National Environmental Balancing Bureau (NEBB). NEBB-01, Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems, is available from NEBB, 1385 Picard Drive, Rockville, MD 20850, (301)977-3698.
- **ee**) National Fenestration Rating Council (NFRC). NFRC 100-91, Procedure for Determining Fenestration Product Thermal Properties, is available from NFRC, 1300 Spring Street, Suite 120, Silver Spring, MD. (301) 589-NFRC.
- **ff)** National Fire Protection Association, Inc. (NFPA). NFPA codes listed in Table 2-7 are available from the National Fire Protection Association, Inc. (NFPA), Battery March Park, Quincy, MA 02269. Telephone: (617) 770-3000.

	TABLE 2-7 - NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODES		
Code No.	Code Description		
NFPA 54	National Fuel Gas Code		
NFPA 70	National Electrical Code		
NFPA 72	National Fire Alarm Code		
NFPA 74	Standard for Installation, Maintenance, and Use of Household Fire Warning Equipment		
NFPA 101	Life Safety Code		
NFPA 101M	Alternative Approaches to Life Safety		
NFPA 211	Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances		
NFPA 255	Method of Test of Surface Burning Characteristics of Building Materials		
NFPA 501A	Manufactured Home Installations		
NFPA 701	Standard Methods of Fire Tests for Flame Resistant Textiles and Films		

- gg) National Sanitation Foundation, 3475 Plymouth Road, P.O. Box 1468, Ann Arbor, MI 48106. Telephone: (313) 769-8010.
- **hh**) National Wood Window and Door Association (NWWDA) standard, NWWDA I.S.2, Standard for Wood Window Units is available from the National Wood Window and Door Association (NWWDA), 205 Touhy Ave., Des Plaines, IL 60018, (312) 299-5200.
- ii) Sheet Metal and Air Conditioning Contractors National Association (SMACNA). SMACNA Installation Standards for Residential Heating and Air Conditioning Systems and SMACNA-07, HVAC Systems, Testing, Adjusting, and Balancing, are available from SMACNA, 8224 Old Courthouse Road, Tysons Corner, Vienna, VA 22180.
- jj) Steel Structures Painting Council (SSPC). Specifications listed below are available from the following Web site: http://www.sspc.org/. SSPC-Paint 21, White or Colored Silicone Alkyd Paint, SSPC-Paint 25, Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II.
- **kk**) Uni-Bell PVC Pipe Association (UBPPA). The specification listed below is available from the following Web site: http://www.uni-bell.org/. UNI-B-6, Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.
- **II)** Underwriters Laboratories, Inc. (UL) specifications listed in Table 2-8 are available from the Underwriters Laboratories, Inc. (UL), 333 Pfingston Road, Northbrook, IL 60062. Telephone: (312) 272-8800.

TABLE 2-8 - UNDERWRITERS LABORATORIES SPECIFICATIONS		
No.	Description (Specs. are DoD Adopted)	
UL 174	Water Heaters, Household Electric Storage Tank Type	
UL 217	Smoke Detectors	
UL 250	Household Refrigerators and Freezers	
UL 430	Waste Disposers	
UL 507	Electric Fans	
UL 555	Fire Dampers	
UL 749	Household Electric Dishwashers	
UL 858	Household Electric Ranges	
UL 900	Test Performance of Air Filter Units	
UL 2034	Carbon Monoxide Detectors	

## PART 3 – SUSTAINABLE DESIGN & CONSTRUCTION CRITERIA

## **INDEX**

## 3 SUSTAINABLE DESIGN AND CONSTRUCTION CRITERIA

3.1 ORIECTIVE	a

- 3.1.1 Fundamental Principles of Sustainable Design of the Built Environment
- 3.1.2 Integrated Design Build
- 3.2 ENERGY AND ENVIRONMENTAL GOALS
- 3.3 DESIGN AND CONSTRUCTION CONSIDERATIONS AND INSTRUCTIONS
  - 3.3.1 EarthCraft Guidelines
    - 3.3.1.1 Required measures to be incorporated into the design and construction
    - 3.3.1.2 Site Planning
    - 3.3.1.3 Air Leakage
    - 3.3.1.4 Windows
    - 3.3.1.5 Heating and Cooling Equipment
    - 3.3.1.6 Energy Efficient Lighting and Appliances
    - 3.3.1.7 Durability
    - 3.3.1.8 Waste Management
    - 3.3.1.9 Indoor Air Quality
    - 3.3.1.10 Moisture Control
    - 3.3.1.11 Ventilation
    - 3.3.1.12 Material
    - 3.3.1.13 Water Indoor

#### 3.4 DOCUMENTATION TO BE INCLUDED IN OFFER

- 3.4.1 EarthCraft Rating System
- 3.4.2 Erosion and Sedimentation Control Plan
- 3.4.3 Reduced Site Disturbance
- 3.4.4 Stormwater Management
- 3.4.5 Construction Waste Management
- 3.4.6 Certified Wood
- 3.4.7 Indoor Air Quality Management
- 3.4.8 Functional Life of the Facility and Supporting Systems

## PART 3 – SUSTAINABLE DESIGN & CONSTRUCTION CRITERIA

## 3.1 OBJECTIVES

Sustainable design and construction techniques shall be considered as they relate to site and buildings. Techniques that conserve energy, improve livability and can be justified by lifecycle cost analysis are encouraged. Integration of energy conservation systems with housing unit design (i.e. lighting, structure, mechanical systems, and aesthetics) is essential to facilitate livability and maximum energy savings. The paragraphs that follow define goals and general objectives for inclusion and achievement of sustainable considerations for this project.

Primary references include the following. Refer to these documents for questions of extent of the effort expected, referenced standards, or detailed requirements.

- 1. Leadership in Energy and Environmental Design (LEED) Reference Guide Version 2.1, U.S. Green Building Council, <a href="https://www.usgbc.org">www.usgbc.org</a>
  - LEED defines the accepted standard for the rating of green design in the United States. The Army Corps of Engineers document, SPiRiT, is based in part on LEED.
- Sustainable Design for Military Facilities, Army Corps of Engineers, ETL 1110-3-491, http://www.usace.army.mil/inet/usace-docs/eng-tech-ltrs/etl1110-3-491/toc.htm
  - Appendix C of this document, Sustainable Project Rating Tool (SPiRiT), is oriented primarily for large structures, but provides a good organization to the issues of sustainable design and construction.
- 3. EarthCraft House Guidelines, Greater Atlanta Homebuilders Association and Southface Energy Institute, <a href="http://www.southface.org/home/ech/earthcraft">http://www.southface.org/home/ech/earthcraft</a> home.htm
  - This document is oriented to residential design and construction. It forms the basis for these Sustainable Criteria.

Sustainable design includes efficient use of natural resources, better performing, more desirable, and more affordable infrastructure and buildings. The overall goal of sustainable design is to be environmentally responsible in delivery of facilities. The key traditional elements for decision making in the facility delivery process are cost, quality, and time. These elements are herein expanded to include the ecological and human health impacts of all facilities design and construction decisions.

The main objectives of sustainable design are to avoid resource depletion of energy, water, and raw materials; prevent environmental degradation caused by facilities and infrastructure throughout their life cycle; and create built environments that are livable, healthy, and productive. Refer to the <a href="Whole Building Design Guide">Whole Building Design Guide</a>, <a href="http://www.wbdg.org/">http://www.wbdg.org/</a>, hosted by the National Institute of Building Sciences (NIBS).

## 3.1.1 Fundamental Principles of Sustainable Design of the Built Environment

## Optimize Site Potential

Creating sustainable buildings starts with proper site selection, including consideration of the reuse or rehabilitation of existing buildings. The location, orientation, and landscaping of a building affect the local ecosystems, transportation methods, and energy use.

## Minimize Energy Consumption

A building should rely on conservation and passive design measures rather than fossil fuels for its operation. It should meet or exceed applicable energy performance standards.

## Protect and Conserve Water

In many parts of the country, fresh water is an increasingly scarce resource. A sustainable building should reduce, control or treat site-runoff, use water efficiently, and reuse or recycle water for on-site use when feasible.

#### Use Environmentally Preferable Products

A sustainable building should be constructed of materials that minimize lifecycle environmental impacts such as global warming, resource depletion, and human toxicity. In a materials context,

lifecycle includes raw materials acquisition, product manufacturing, packaging, transportation, installation, use, and reuse/recycling/disposal.

## Enhance Indoor Environmental Quality (IEQ)

The indoor environmental quality (IEQ) of a building has a significant impact on occupant health, comfort, and productivity. Among other attributes, a sustainable building should maximize day lighting, have appropriate ventilation and moisture control, and avoid the use of materials with high-VOC emissions.

## Optimize Operational and Maintenance Practices

A sustainable building should be designed to take into account the energy and environmental impacts of operating and maintaining the building. Designers are encouraged to specify materials and systems that reduce the need for maintenance, and/or require less water, energy, and toxic chemicals and cleaners to maintain.

## 3.1.2. Integrated Design Build

A central strategy of sustainable design is to take an integrated approach. Issues are not itemized in isolation; they are addressed in an integrated holistic decision making process.

## 3.2 ENERGY AND ENVIRONMENTAL GOALS

In priority order, project goals include:

- 1. Reduce operating costs and energy consumption (particularly use of electricity and natural gas).
- 2. Reduce other natural resource consumption (especially water).
- 3. Use materials in the project that minimizes adverse impacts on the environment (extraction, refinement, fabrication, shipping, installation, use, disassembly, and disposal/reuse/recycling.

The effectiveness of addressing these goals will be an important part of the evaluation process for offers received.

## 3.3 DESIGN AND CONSTRUCTION CONSIDERATIONS AND INSTRUCTIONS

The criteria documents were developed with sustainable design principles. The primary considerations for the site design are protection of the maximum amount of existing natural and conservation area possible. Passive solar considerations and other energy saving measures, efficient use of materials, and the desire for good indoor air quality must shape the design of the units.

#### 3.3.1 EarthCraft Guidelines.

The design and construction will be measured against the EarthCraft House Rating System. The successful Contractor shall provide documentation (drawings, cut sheets of installed materials and systems, etc.) to the Contracting Officer at the earliest possible time in the design/build process. The Contracting Officer will determine the required extent of the documentation for compliance with EarthCraft requirements.

As part of the overall EarthCraft points indicated in the offer, the project is required to satisfy the following specific EarthCraft measures. EarthCraft points of the following measures plus those inherent in the unit designs total in excess of 100 points.

#### 3.3.1.1 Required Measures to be Incorporated into the Design and Construction

- The Contracting Officer will determine whether adherence to these requirements has been maintained during construction. Criteria for Sustainable Design and Construction should be a typical agenda discussion item at construction meetings.
- 2. The Contracting Officer will determine acceptability of product and systems submittals.

## 3.3.1.2 Site Planning

- 1. Provide an Erosion and Sedimentation Control Plan detailing the provisions taken to prevent erosion and sedimentation adjacent to the construction area.
- 2. Provide a Tree Preservation Plan detailing the provisions taken to preserve trees and natural vegetation in the construction area.
- 3. Protection of the natural and conservation areas and habitat is required. These areas are designated on the Land Use Plan (refer Part 4). Construction activities are prohibited or severely limited in these areas. Sedimentation as a result of construction activities must be minimized in conservation areas.

## 3.3.1.3 Air Leakage

- 1. Conduct an air leakage test certifying maximum 0.35 air changes per hour. Provide documentation from an independent certifying entity or under supervision of the Contracting Officer.
- 2. Provide infiltration barrier (sealed at plates, seams, and openings).
- 3. Provide minimum R-10 insulation overlaid with vapor barrier under slabs on grade (at conditioned spaces) for the first four feet around the perimeter of the building (adjacent to the foundation insulation).
- 4. Provide minimum R-10 insulation at the interior face of basement or crawl space walls.
- 5. Provide minimum composite R-24 wall system.
- 6. Insulate cavities full at corners, T-intersections, band joists, and headers.
- 7. Provide minimum R-38 insulation at attic/ceilings over conditioned spaces.

## 3.3.1.4 Windows

- 1. Provide NFRC rated windows with maximum U-value of 0.56. See http://www.nfrc.org/nfrcpd.html
- 2. Provide double glazed, low emissivity glazing with a minimum 10-year glazing warranty.

## 3.3.1.5 Heating and Cooling Equipment

- 1. Size heating and cooling equipment to within 10% of the Manual J guidelines published by the Airconditioning Contractors of America (ACCA). The industry standard, Manual J shows you how to calculate the heating and cooling loads of single family homes, townhouses, and apartment buildings: <a href="http://www.accaconference.com/Merchant2/merchant.mv?Screen=CTGY&Store\_Code=ACCOA&Category\_Code=M">http://www.accaconference.com/Merchant2/merchant.mv?Screen=CTGY&Store\_Code=ACCOA&Category\_Code=M</a>.
- 2. Provide furnace-heating systems with an Annual Fuel Utilization Efficiency (AFUE) of at least 90%. Demonstrate EarthCraft equivalency if a heat pump system is proposed.
- 3. Provide air-conditioning systems with a Seasonal Energy Efficiency Ratio (SEER) of 14 or greater. Demonstrate EarthCraft equivalency if a heat pump system is proposed.

## 3.3.1.6 Energy Efficient Lighting and Appliances

- 1. Provide 100% compact fluorescent fixtures with minimum 3000K lamps.
- 2. Provide automatic photocell, motion, or timer controls on exterior light fixtures.
- 3. Provide Energy Star dishwasher. See <a href="http://www.energystar.gov/products/">http://www.energystar.gov/products/</a>.
- 4. Provide Energy Star refrigerator.

## 3.3.1.7 Durability

1. Provide minimum roofing warranty of 40 years.

- 2. Provide window and door head flashing.
- 3. Provide continuous foundation termite shield.
- 4. Provide rain gutters, downspouts, splash blocks and positive slope of at least 1:20 (5%) for the first 8 feet around the building.

## 3.3.1.8 Waste Management

1. Provide a waste management plan showing what materials will be separated, received by a recycler or reused on site, and diverted from the landfill. If possible, utilize the resources listed below from the Recycling and Reuse Directory provided by the AIA Kansas City's Committee on the Environment. Direct all subcontractors to follow the waste management plan. Post this plan at the job site and review at construction meetings.

Selected Building Decon- struction	Reuse	Will deconstruct and palletize, and ship selected building components	Habitat Restore:
			816-231-6889
Architectural Salvage	Reuse	Will buy a wide variety of items: lighting, hardware, doors, columns, etc. Interested in "period" materials.	Architectural Salvage:
			816-283-3740 (on Broadway) 816-842-4606 (on Cherry)
	Reuse	Wants items that are older than the 50's. Windows, light fixtures, columns, facades, old brick, etc. Drop off is preferable, but pickup is possible.	Cummings Corner Antiques:
			816-753-5353
Asphalt	Reuse	Recycles asphalt only. Drop off is preferable.	APAC: 913-814-6700
	Reuse	Construction company with a quarry. Materials must be dropped off.	Damon Pursell:
			816-792-1031
	Reuse	Recycles road construction materials. Pickup fees: \$10 for a pickup, \$20 for a dump-truck, \$30 for a trailer. (pick up for wood waste is priced differently, see "wood waste").	Kaw Valley Recycled Materials:
			913-287-6729
	Reuse	Will accept asphalt. Must be dropped off.	Metropolitan Land Reclamation Site:
			816-432-8445
	Reuse	Must be clean. Call ahead. Drop off is preferable.	Superior Bowen Asphalt Co.:
			816-921-8200
Asphalt based roofing scrap	Recycle	Construction company with a quarry. Materials must be dropped off.	Damon Pursell:
			816-792-1031
Batteries	Recycle	Located in Des Moines, but will arrange pickups in KC.	A-Tec Recycling Inc.:
			800-223-9305
		Recycles mainly hazardous wastes. Hazardous materials must be picked up, non-hazardous can be dropped off or picked up.	Phillip Environmental:
			816-474-1391
Brick	Reuse	Construction company with a quarry. Materials must be dropped off.	Damon Pursell:
			816-792-1031
	Reuse	Will buy brick and lumber.	Ben Tarbe Brick:
			913-432-9726
	Reuse	Recycles road construction materials. Pickup fees: \$10 for a pickup, \$20 for a dump-truck, \$30 for a trailer. (pick up for wood waste is priced differently, see wood waste).	Kaw Valley Recycled Materials:
			913-287-6729
	Reuse	500 brick minimum. They will inspect the bricks and pick them up.	Evan's Building Materials:
			816-523-4050
	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is	Habitat Restore:

		preferable, but pickup can be arranged. Accepts clean brick, especially pavers. Tax credit available.	816-231-6889
	Reuse	Will accept brick. Must be dropped off.	Metropolitan Land Reclamation Site: 816-432-8445
	Reuse	Buys some brick, will pick up for a fee, but brick can be dropped off.	Quality Sand and Material Co.:
	Reuse	3 day reservation for pickup, deconstruction consulting	816-254-7979 John Cunningham: 816-741-6182
Cardboard	Recycle	Pickup can be arranged.	Smurfit recycling: 913-236-8000
	Recycle	Contact them for more resources. Have their own facilities, and can refer you to other companies.	Community Recycling Centers: 816-561-1090
Carpet and padding	Recycle	Will take carpet and padding, but it must be dry. Will not take rubber padding. Carpet can be dropped off or picked up for a fee.	Environmental Recycling Services:
	Recycle	Will recycle any type of carpet. They will provide a trailer on site, or you can drop off carpet.	913-390-9331 Flooring Resources:
	Reuse	Accepts new and used carpet in good, clean condition. No pet odors or stains. Will take carpet padding. Drop off preferred but pickup is possible.	816-842-7070 Habitat Restore:
	Recycle	Will take all carpet and foam. Pickup only, \$75 dollar minimum fee. They will bid commercial jobs before pickup.	816-231-6889 Metro Carpet Recycling: 913-381-3015
	Recycle	Will recycle their own Shaw brand "environmentally guaranteed" and "Nylon 6 Broadloom" carpet for free (no cushion backed). Any other carpet is \$.07/lb. Recycler (Kruse Industry) is in Indianapolis. They can arrange shipping for \$1.35/mile, or you can provide your own. Contact local reps for arrangements.	Shaw Industries:
		oomaat room rope for arrangements	1-877-502-7429
Ceilings	Recycle	Some manufacturers will recycle old ceilings if you are installing their new products. Check with the manufacturer.	Consult companies
		Armstrong will recycle their old ceilings if you buy new ceilings from them. Must have at least one truckload before pickup is possible. Contractor would have to put tiles on pallets. Contact the headquarters and local rep at 1-800-448-1405 ext. 8172.	Armstrong:
	-		1-877-ARMSTRONG
Concrete	Reuse	Construction company with a quarry. Materials must be dropped off.	Damon Pursell: 816-792-1031
	Reuse	Recycles road construction materials. Pickup fees: \$10 for a pickup, \$20 for a dump-truck, \$30 for a trailer. (pick up for wood waste is priced differently, see wood waste).	Kaw Valley Recycled Materials:
	Reuse	Will accept concrete. Must be dropped off.	913-287-6729 Metropolitan Land Reclamation Site: 816-432-8445
Dirt	Reuse	Construction company with a quarry. Materials must be dropped off.	Damon Pursell:
	Reuse	Will accept dirt. Must be dropped off.	816-792-1031 Metropolitan Land Reclamation Site: 816-432-8445
	Reuse	Recycles road construction materials. Pickup fees: \$10 for a pickup, \$20 for a dump-truck, \$30 for a trailer. (pick up	

1		T	I
		for wood waste is priced differently, see wood waste).	212 227 1722
D	D	Donald of Habitat for Housestine Will take departing of	913-287-6729
Doors	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
			816-231-6889
	Reuse	3 day reservation for pickup, deconstruction consulting.	John Cunningham:
			816-741-6182
	Reuse	Local nonprofit org. Will take donations of office equipment and furniture. Pickups can be arranged.	Surplus Exchange:
			816-472-0444
Flooring (resilient)	Ruse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
			816-231-6889
Fluorescent lamps	Recycle	Located in Des Moines, but will arrange pickups in KC.	A-Tec Recycling Inc.:
			800-223-9305
		Recycles mainly hazardous wastes. Hazardous materials must be picked up, non-hazardous can be dropped off or picked up.	Phillip Environmental:
			816-474-1391
	Recycle	A retail store. Will take small amounts of clear glass.	Gene's Glass
			816-741-4464
Metals			
Ferrous and non-ferrous	Recycle	Will recycle all ferrous and non-ferrous metals. Will arrange containers on site, or materials can be dropped off.	American Compressed Steel:
			816-842-7372
	Recycle	Will buy all nonferrous metals. Will take steel and iron (ferrous) but do not buy it. Will pickup or you can drop off.	City Scrap Metal LLC:
			816-525-4332
	Recycle	Recycles ferrous and non-ferrous metals. Containers can be provided on site for free, or you can drop off materials.	Frank Metal Co.:
			816-231-2600
	Recycle	Will buy ferrous and nonferrous metals. Will provide container service on site for a fee, otherwise materials must be dropped off.	GALAMET:
			816-861-2700
	Recycle	Local metals recycler. Will recycle all metals, including nonferrous and ferrous. They will provide on site containers for a small fee, or you can drop off materials.	Langley's Recycling:
			816-924-8452
	Recycle	Will buy ferrous and non-ferrous metals. Containers can be provided, or you can drop off.	Mallin Bros. Co. Inc.:
	Desirals	Will require all formation and non-formation readels. On either	816-483-1800
	Recycle	Will recycle all ferrous and non-ferrous metals. On site containers can be arranged, as can drop off.	National Compressed Steel:
	Recycle	Recycles ferrous and non-ferrous metals. Containers can	913-321-3358 North Kansas City Iron and
	Recycle	be provided for free, or you can drop off materials.	Metal:
			816-471-3244
	Pocyclo	Will recycle formus and pon formus metals. Containers	816-471-3244
	Recycle	Will recycle ferrous and non-ferrous metals. Containers can be provided on site, or materials can be dropped off.	Shostak Iron & Metal Co.:
		can be provided on site, or materials can be dropped off.	Shostak Iron & Metal Co.: 913-321-9210
	Recycle Recycle		Shostak Iron & Metal Co.: 913-321-9210 Wabash Iron and Metal:
Earroug only	Recycle	can be provided on site, or materials can be dropped off.  Will recycle all ferrous and non-ferrous metals. Will pick up for a fee, or materials can be dropped off.	Shostak Iron & Metal Co.: 913-321-9210 Wabash Iron and Metal: 816-2213454
Ferrous only		can be provided on site, or materials can be dropped off.  Will recycle all ferrous and non-ferrous metals. Will pick up	Shostak Iron & Metal Co.: 913-321-9210 Wabash Iron and Metal: 816-2213454 Kaw River Shredding:
	Recycle Recycle	can be provided on site, or materials can be dropped off.  Will recycle all ferrous and non-ferrous metals. Will pick up for a fee, or materials can be dropped off.  Will buy ferrous metals. Must be dropped off.	Shostak Iron & Metal Co.: 913-321-9210 Wabash Iron and Metal: 816-2213454 Kaw River Shredding: 913-621-2711
Ferrous only Non-ferrous only	Recycle	can be provided on site, or materials can be dropped off.  Will recycle all ferrous and non-ferrous metals. Will pick up for a fee, or materials can be dropped off.	Shostak Iron & Metal Co.: 913-321-9210 Wabash Iron and Metal: 816-2213454 Kaw River Shredding: 913-621-2711 As Is Recycling Inc.:
Non-ferrous	Recycle Recycle	can be provided on site, or materials can be dropped off.  Will recycle all ferrous and non-ferrous metals. Will pick up for a fee, or materials can be dropped off.  Will buy ferrous metals. Must be dropped off.  Recycles non-ferrous metals. Pick up is possible, or	Shostak Iron & Metal Co.: 913-321-9210 Wabash Iron and Metal: 816-2213454 Kaw River Shredding: 913-621-2711

	Recycle	Will recycle non-ferrous metals. They are downsizing the recycling portion of their business, call to see if they're interested.	Frog's Recycling Plaza:
			816-924-7788
	Recycle	Will recycle non-ferrous metals. Pickups are free, or materials can be dropped off.	KC Iron and Metal Co.:
			816-471-2854
	Recycle	Recycles non-ferrous metals. Will pick up large quantities or materials can be dropped off.	Mid-America:
			913-831-1541
Ornamental façade	Reuse	3 day reservation for pickup, deconstruction consulting	John Cunningham:
			816-741-6182
	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
			816-231-6889
Paint	Reuse	Nonprofit, will take donations. Call first.	Starlight Theatre:
			816-333-9481
	Reuse	Branch of Habitat for Humanity. Will take full cans of paint, no partials. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
			816-231-6889
	Reuse	A nonprofit, will take donations. Call first.	Coterie Theatre:
			816-474-6785
Pallets	Reuse	Complete list of pallet buyers is too long to list here. Consult the yellow pages under "Pallets & Skids." The following companies are 5 randomly selected examples.	South Western Bell Yellow Pages:
		Tollowing companies are 5 rundomy selected examples.	"Pallets & Skids"
	Reuse	Will buy certain sizes. You can pay them to pick up pallets, or they will buy your pallets if you drop them off.	Pioneer Pallet Brokerage Co.:
			816-231-4004
	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
			816-231-6889
	Reuse	Will buy 48x40 only. Call to workout pickup or drop off arrangements.	Ajrek Pallet Co:
			816-313-9315
	Reuse	If you have less than 100, you must drop them off. If you have more than 100, pickup can be arranged. Mainly interested in 48x40's. Will also recycle pallets into mulch.	Acorn Products Inc:
	_		816-792-8800
	Reuse	Will buy certain sizes. Must be dropped off. 20 pallet minimum.	Ace Pallet Service:
	-	0 + + 11 - 6	913-3712777
Plastic products	Recycle	Contact them for more resources. They have their own facilities, and can refer you to other companies.	Community Recycling Centers:
		NAPIL I I I I I I I I I I I I I I I I I I	816-561-1090
	Recycle	Will recycle almost any plastic. Main types are polycarbonate, ABS, polystyrene, nylon, acrylic, PVC, and PET. Located in Salina, KS. They prefer to pick up the material, and will do so for free.	Midwest Plastics Processing and Recycling Inc:
			785-823-2400
	Recycle	Recycle almost all post-industrial plastics. Will buy scrap plastic. Pickup or drop off can be arranged.	ST Joseph Plastics:
		0 1 1 1 1 5 5 5 6 1 1 1 1 1 1 1 1 1 1 1 1	1-888-279-1415
	Recycle	Specializing in LDPE film and most post industrial plastics.	Mallin Bros. Co. Inc.:
	Descri	Will only records winid DVO 1 t - t : 0 :	816-483-1800
	Recycle	Will only recycle rigid PVC. Located in Gainesville, MO.	Bryant Plastics: 417-679-3787
Plumbing materials	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:

			816-231-6889
Polystyrene	Reuse	Will take back clean, dry, uncontaminated, white, polystyrene foam. Must be dropped off.	Contour Products Inc.:
			913-321-4114
Rebar	Recycle	Recycles road construction materials. Pickup fees: \$10 for a pickup, \$20 for a dump-truck, \$30 for a trailer. (pick up for wood waste is priced differently, see wood waste).	Kaw Valley Recycled Materials:
5 6	_		913-287-6729
Roofing- corrugated metal	Reuse	3 day reservation for pickup, deconstruction consulting	John Cunningham:
			816-741-6182
Stone	Reuse	Construction company with a quarry. Materials must be dropped off.	Damon Pursell:
	Davisa	Describes and construction meetanists. Distant force, \$10 for	816-792-1031
	Reuse	Recycles road construction materials. Pickup fees: \$10 for a pickup, \$20 for a dump-truck, \$30 for a trailer. (pick up for wood waste is priced differently, see wood waste).	Kaw Valley Recycled Materials:
			913-287-6729
	Reuse	Will accept stone. Must be dropped off.	Metropolitan Land Reclamation Site:
	D	Donate of Helitat for Housestine Will take departing of	816-432-8445
	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
			816-231-6889
Tyvek	Recycle	Will facilitate tyvek recycling with regional or local recyclers	Dupont Tyvek:
			800-44TYVEK
Windows	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
			816-924-1096
Wire	Recycle	Specializing in insulated copper and insulated aluminum wire. Container service available or you can drop off materials.	Mallin Bros. Co.:
			816-483-1800
	Recycle	Will recycle ferrous and non-ferrous metals. Containers can be provided on site, or materials can be dropped off.	Shostak Iron & Metal Co.:
	_		913-321-9210
Wood (lumber)	Reuse	Nonprofit, will take donations for reuse. Call first.	Coterie Theatre
	_		816-474-6785
	Reuse	Branch of Habitat for Humanity. Will take donations of construction materials in good condition. Drop off is preferable, but pickup can be arranged.	Habitat Restore:
		_	816-231-6889
	Reuse	Will buy brick and lumber.	Ben Tarbe Brick:
			913-432-9726
Wood waste - trees and brush	Recycle	Construction company with a quarry. Materials must be dropped off.	Damon Pursell:
			816-792-1031
	Recycle	Recycles road construction materials. Pickup fees: \$70 for a pickup, \$120 for a dump-truck, \$145 for a trailer. (road construction waste is priced differently; see asphalt, stone, etc.)	, ,
	1		913-287-6729

## 3.3.1.9 Indoor Air Quality

- 1. Provide dedicated combustion air supply to the furnace (if gas fired).
- 2. Provide carbon monoxide detectors in accordance with the requirements of Part 9.

## 3.3.1.10 Moisture Control

 Provide under-floor vapor retarder, in crawl space and on minimum 4" gravel bed under slab-on-grade floors.

#### 3.3.1.11 Ventilation

- 1. Provide passive radon / soil gas vent system.
- 2. Provide a ceiling fan in each bedroom and in living areas.

#### 3.3.1.12 Material

- 1. Use no materials containing urea formaldehyde inside conditioned spaces (manufactured wood products, etc. at subfloors, cabinetry, and countertops).
- 2. Protect ducts and registers from construction debris.

#### 3.3.1.13 Water - Indoor

1. Provide Energy Star (gas 0.62 minimum, electric 0.92 minimum) water heater.

#### 3.4 DOCUMENTATION TO BE INCLUDED IN THE OFFER

- 3.4.1. EarthCraft Rating System State the minimum number of points that will be achieved in the EarthCraft House Rating System by the Offerer's design and construction. This includes both the required EarthCraft measures stated above and additional EarthCraft measures that the Offerer shall incorporate in its design and construction.
  - The following tasks are indicated in the Sustainable Project Rating Tool (SPiRiT), Army Corps of Engineers ETL 1110-3-491.
- 3.4.2. Erosion and Sedimentation Control Plan Description of the methods or standards that will be followed. (1.R1)
- 3.4.3. Reduced Site Disturbance Describe the measures that will be taken to minimize the extent of site disturbance and protect sensitive habitat areas (conservation areas). (1.C5)
- 3.4.4. Stormwater Management Describe the measures that will be taken to minimize stormwater runoff, increase on-site infiltration, and reduce contaminants. (1.C6)
- 3.4.5. Construction Waste Management Describe the measures that will be taken and the materials that will be recycled or reused and diverted from the landfill. (4.C2)
- 3.4.6. Certified Wood State the percentage of wood on the project that will be certified by the Forest Stewardship Council guidelines as being harvested in an environmentally responsible manner. See <a href="http://www.fscoax.org/principal.htm">http://www.fscoax.org/principal.htm</a>. (4.C7)
- 3.4.7. Indoor Air Quality Management Describe the measures that will be taken to insure the effective management of air quality during construction (minimizing moisture exposure of absorptive materials that are susceptible to microbial contamination such as mold, HVAC system protection and cleaning, level of particulate filtering, and filter cleaning). (5.C3 and 5.C10)
- 3.4.8. Functional Life of the Facility and Supporting Systems Assess the functional life of the building assemblies and supporting systems, and the maintenance requirements to achieve the designated functional life. The assessed functional life may be in excess of warranties provided. Assembly and system categories include siding and trim, structure, flooring, cabinetry, HVAC, plumbing, communications, and electrical systems. (8.C1)

# PART 4 – SITE

# **INDEX**

PA	PART 4 – SITE		
IN	IDEX		
4	SITE	2	
	4.1 EXISTING SITE CONDITIONS	2	
	4.1.1 Government Provided Information	2	
	4.1.2 Engineering Survey		
	4.1.2.1 Ground Control		
	4.1.2.2 Coordinate Listing		
	4.1.2.3 Reference Ties	2	
	4.2 SITE PREPARATION	2	
	4.2.1 Pavement Removal/Utility Protection	2	
	4.2.2 Utility Interference	3	
	4.3 SITE PLANNING	3	
	4.3.1 General	3	
	4.3.2 Land Use / Planning		
	4.3.2.1 Neighborhoods		
	4.3.2.2 Open / Recreation Space		
	4.3.2.3 Circulation Systems		
	4.3.3 Transitions	6	
	4.3.4 Neighborhood Design	6	
	4.3.4.1 Community Zone		
	4.3.4.2 Streetscape Zone		
	4.3.4.3 Private Zone		
	4.3.4.4 Common Interior Zone (optional)		
	4.3.5 Open / Recreation Space Design		
	4.3.5.1 Playgrounds and Tot lots		
	4.3.5.2 Trail		
	4.4 Construction Specifications		
	4.4.1 General		
	4.4.2 Concrete And Asphaltic Concrete		
	4.4.3 Driveways		
	4.4.4 Traffic Control and Street Signs		
	4.4.5 Fences		
	4.4.5.1 Controlled Access Perimeter Fence	15	
	4.4.5.2 Rear Yard Fence		
	4.5 SUBMITTAL REQUIREMENTS	15	
	4.5.1 Development Plan	15	
	4.5.2 Neighborhood Site Design Plan	16	

# 4 SITE

## 4.1 EXISTING SITE CONDITIONS

#### 4.1.1 GOVERNMENT PROVIDED INFORMATION

Government provided topographical survey, boundary survey, and geotechnical report are provided as information to assist the contractor in preparing the offer. Any errors identified shall be brought to the attention of the contracting officer immediately for resolution and direction. The contractor shall take all professionally prudent and reasonable actions to verify the accuracy of the data provided. During design and construction, the contractor shall be responsible for obtaining any additional data necessary for the execution of this project.

## 4.1.2 ENGINEERING SURVEY

The Contractor shall complete an engineering survey of the project site. The survey CADD files shall be in English units and in Microstation format. The survey shall be used by the Contractor to prepare his design drawings. The mapping shall indicate the vertical and the horizontal datums used in the preparation of the surveys. Survey data shall be provided to the Contracting Officer for inclusion into the Whiteman AFB data base. All new utilities shall be surveyed for location prior to backfilling. Coordinates of all branch lines and changes in direction shall be documented and provided to the Contracting Officer.

## 4.1.2.1 Ground Control

The ground control shall be developed with accuracy commensurate to support the mapping. The survey will be developed in coordination with the existing Whiteman AFB surveys, in English units in U.S. Survey Feet. All final supplied results will be True State Plane at zero elevation. As per reference EM1110-1-1002, use the Type G monuments as a guide for any new control set as part of this contract.

# 4.1.2.2 Coordinate Listing

The horizontal coordinates of all control used or installed shall be provided in tabular form on 8-1/2" X 11" sheets. The coordinate system used shall be indicated and combination factor used shall be shown. Coordinates accomplished in state plane zones shall not be listed in any other system (modified) than true state plane at zero elevation.

#### 4.1.2.3 Reference Ties

Provide descriptions showing at least 3 ties to all monuments set in the field. Approximate directions and a sketch shall illustrate measured distances. Coordinates and appropriate State Plane system designation shall be shown on the card. If field features (trees, posts, etc.) are not available for ties, then witness posts shall be set. Fence posts or carsonite markers are suitable for this purpose. Reference EM 1110-1-1002 survey markers and Monumentation for guidance in establishing these monuments.

## 4.2 SITE PREPARATION

## 4.2.1 PAVEMENT REMOVAL/UTILITY PROTECTION

The Contractor shall avoid running utilities underneath houses, streets, and sidewalks where at all practicable. In cases where it is necessary for the utilities to cross existing streets and sidewalks the Contractor shall install the lines by boring and jacking methods. No open trenching will be allowed unless written permission is obtained and approved by Whiteman AFB Civil Engineering. When open trench methods are approved, streets and sidewalks shall be sawcut, removed and replaced as required to construct

the utility. Portions of walks and concrete pavements requiring removal shall be removed to the nearest contraction joint.

#### 4.2.2 UTILITY INTERFERENCE

All existing utilities, including but not limited to storm drains, electrical, sanitary sewer, gas, water, and communication lines that are crossed during installation of the new water system shall remain in service during construction. If this is not possible, all outages shall be coordinated with the Contracting Officer's Representative seven (7) days prior to the outage. All underground utilities from field data and surveys, site investigations, and digging permit locates, shall be marked within and adjacent to areas of the work. All work areas shall be investigated with detection devices for cables and pipelines, to confirm locations, identify unknown utilities, and establish depths. All underground utilities potentially disturbed by the work shall be found by hand digging prior to mechanical trenching or excavating in the vicinity. The government representative shall be notified of detection activities 48 hours in advance. Detection devices shall be onsite at all times.

## 4.3 SITE PLANNING

#### 4.3.1 GENERAL

The planning, design, and construction shall follow the goals, standards, and guidelines in this RFP. Where no guidance is specified under this RFP, or for context in interpreting the goals, standards, and guidelines of this RFP, the Offerors shall follow the general guidance provided in the following documents in descending order of priority:

- a) Whiteman AFB Design Compatibility Standards.
- b) Whiteman AFB Landscape Development Plan (February 1991)
- c) Whiteman AFB Housing Community Plan (19 February 1999).
- d) Air Force Family Housing Guide (December 1995).

In the event of a conflict between any of these guides and something that is addressed more specifically in this RFP, the more specific guidance of this RFP shall control.

A major site-planning objective is to ensure an interesting, attractive, livable residential environment and to utilize the potential advantages of the site through planning and site design. Where any of these documents allow options that are not specifically addressed by a document having greater priority, the contractor shall use the option most beneficial to meeting the major goals of this project as stated in the RFP.

Planning shall take into consideration:

- topography;
- preservation of existing trees;
- climatic conditions; and
- prevailing winds.
- retaining some public frontage and exposure to the lake area

Design should capitalize upon:

- economics inherent in the natural character of the site;
- using existing terrain to minimize cut and fill;
- utilize natural drainage features;
- reducing total impervious surface; and
- consolidating utilities and common open spaces.

# 4.3.2 LAND USE / PLANNING

Refer to Figure 4.3.1 - Conceptual Land Use Map, at the end of Part 4. The Conceptual Land Use Map contains the following general land areas:

- Conservation Area No Work this area includes the existing lake and areas immediately adjacent to the shoreline. No work of any kind shall occur in this area.
- Conservation Area No Housing these areas include topographical challenges and stands of existing vegetation and drainage. These areas should not include any structures, although they can be used to

- achieve any dimensional standards in the Site Design Standards or can be utilized as part of an open space or trail network.
- *Through Street Corridor* this general area shall be the location for a primary street connecting each end of the Development Area with the remainder of the Base
- *Trail Connection Corridor* this general area should be the location for a trails connecting the trail system in the Development Area to the existing Whiteman AFB trail system.
- FY03 Development Area –general area for development of the neighborhoods under the FY03 task order.
- FY04 Development Area –general area for development of the neighborhoods under the Option 1 to the FY03 task order.
- Future Development Area –general area for development of the neighborhoods under future task orders.
- Future Single-Family SOQ Housing proposed location for seven (7) single family senior officer quarters to be built under an undetermined future task order.
- Recreation and Access area east of the existing lake to be reserved for recreation area and circulation improvements under an undetermined future task order.
- Development Area the entire area to be incorporated into the Development Plan for this RFP

The Offeror shall submit a Development Plan, subject to the submittal requirements in Section 4.5.1, showing planned land use for the entire Development Area identified on Figure 4.3.1. and stating the total number of units provided in the Development Plan. The Development Plan shall generally follow the Conceptual Land Use Map Figure 4.3.1. However, Offerors may propose a different layout of the FY03, FY04 and Future Development Area provided that: 1) each development area for each task order or option to a task order shall be contiguous; 2) the temporary construction entrance shall be along MO Highway 23; any trailer farm or construction operational headquarters shall be near the gate; and 4) proposed build-out of the development plan shall withdraw away from the existing base and towards the temporary construction entrance.

The Development Plan shall include the following general land use categories: (1) Neighborhoods; (2) Open/Recreation Space; and (3) Circulation Systems. These land use categories should be planned based on the goals and standards in the following sections, and provide for the efficient, logical and economic arrangement of each categories. In addition, the Development Plan shall provide significant functional relationships among each of the land use categories, with particular attention paid to the site plan details where these elements interface (see Section 4.3.3 below on "Transitions").

The Development Plan should provide for 250 to 300 housing units phased for build out of the Development Area, 92 built under the FY03 Task Order and 100 built under the Option1, FY04 portion of this task order. The Offeror shall submit neighborhood site plans for both the FY03 Development Area and the FY04 Development Area, each subject to the detailed Neighborhood Design Standards (Section 4.3.4) and submittal requirements in Section 4.4.2. of this RFP. The Development Plan shall also demonstrate that detailed Neighborhood Design Standards (Section 4.3.4) will be able to be met in each subsequent FY task order shown in the Offeror's Development Plan.

# 4.3.2.1 Neighborhoods

<u>Description</u>: The neighborhood is composed of the housing units and the immediate vicinity of housing units including common, semi-private, and private areas such as yards or patios.

# Goals and Standards:

- Neighborhoods should provide attractive streetscapes and community orientation of all buildings but also provide for the arrangement and layout of buildings that affords quality private areas for residents.
- Community orientation of buildings shall establish a unique neighborhood identity for the project as a whole. In addition, Offerors may provide for unique neighborhood identities within the project.
- Private areas should be located away from the circulation system with land use transitions or screened by appropriate buffer areas.

## 4.3.2.2 Open / Recreation Space

<u>Description:</u> Open / recreation space is composed of all undeveloped areas of the project area, those areas developed for active recreation, or areas preserved from development. Open / recreation space shall include play lots, play areas, natural preserves, and the lake area.

#### Goals and Standards:

- Preserve at least 20% of total project area (excluding the surface area of any bodies of water) as undeveloped natural space. Preserved areas should be selected based on the greatest combination of the following:
  - environmentally or topographically significant land;
  - visual impact on the project as a whole;
  - buffers and transitions for the land use plan; and
  - accessibility for residents from the circulation system.
- Provide tot lots within 1/8 mile of all residences, as measured on the most direct pedestrian circulation route.
- Provide playgrounds within ¼ mile of all residences, as measured on the most direct pedestrian circulation route.
- Incorporate trail corridors throughout the entire Development Plan to link with the existing trail system

# 4.3.2.3 Circulation Systems

<u>Description</u>: Circulation systems include any network for travel of pedestrians or vehicles. Circulation systems shall include at a minimum all streets, sidewalks, and trails open to resident access.

# Goals and Standards:

- Provide one through street for the Development Area. The through street shall be located in the Through Street Corridor designated in Figure 4.3.1. and connect at access points indicated. The specific location and design for this through street should be based on the following:
  - the most direct and efficient route accounting for topographical conditions;
  - minimum disturbance of Conservation Areas indicated on Figure 4.3.1;
  - provide a public frontage for a portion of the preserved lake area; and
  - a "parkway-like" design, particularly with respect to landscaping.
- Local streets providing access to housing units should maintain an interconnected system, with multiple access routes available to most housing units. However, street designs and layouts should discourage non-local traffic on these streets. Cul-de-sacs may be used, however are preferred only when they are necessary to accommodate existing and significant topographic or other natural conditions. (See "Residential Streets," Third Edition, Walter Kulash Principle Author, Urban Land Institute, National Association of Home Builders, American Society of Civil Engineers, Institute of Transportation Engineers (2001); and Traditional Neighborhood Development Street Design Guidelines, A Recommended Practice of the Institute of Transportation Engineers, (October 1999) for the principles and techniques on this goal.)
- A pedestrian circulation system shall provide at least as frequent and direct connections of pedestrian
  facilities as that provided for vehicles. Sidewalks on one side of all local streets is presumed to meet
  this requirement, however alternative pedestrian connections (such as that shared by the trail corridors)
  are encouraged. However, sidewalks (5' wide minimum) shall be located on both sides of the through
  street unless a trail is provided.
- A trail corridor shall be designed throughout the project to provide recreation opportunities. The trail corridor is independent of the pedestrian circulation system. However, the trail corridor may serve as the pedestrian circulation system at appropriate and limited points, provided that each remain distinct elements of the overall circulation system.
- The 45 meter setback from the controlled access perimeter fence around the project area may be used for the circulation system including streets, sidewalks, and trails. However, no buildings are allowed in this area.

# 4.3.3 TRANSITIONS

The Development Plan (Section 4.3.2.) and individual neighborhood site design plans for FY03-FY05 (meeting design standards of Section 4.3.4) should pay special attention to transitions. Transitions occur when areas of different land uses interface or as you move from community to private areas in the neighborhood. Transitions should be designed to define different areas of the project, create diversity among areas, but also maintain a completely integrated community without the need for abrupt segregating elements or isolating the different land use elements by vast amounts of space. Effective transitions can be achieved by the following methods:

- arrange land uses efficiently and effectively so that transition areas serve multiple purposes other than merely separating uses;
- utilize existing natural and topographic features to create transitions;
- alter the design of potentially incompatible elements to eliminate potential negative impacts;
- use site design techniques such as building location and orientation, window placement, and landscape barriers to moderate predictable undesirable noise; and
- provide appropriate buffer areas to separate and visually insulate the community from any undesirable external influences. (see Part 7 Landscaping)

Particular attention shall be paid to the buffer along Highway 23 and the buffer at the connection point of the through street with Symington Ave.

#### 4.3.4 NEIGHBORHOOD DESIGN

Offerors shall submit a neighborhood site design plan, subject to the submittal requirements of Section 4.5.2., for the FY03 development area and the FY04 development area. The FY03 site plan shall include 92 housing units and the Option 1, FY04 site plan shall include 100 housing units. The neighborhood design is comprised of 4 distinct zones, which are part of each housing site. Each zone has separate goals and design standards. These zones are: (1) the Community Zone; (2) the Streetscape Zone; (3) the Private Zone; and (4) the Common Zone (optional). These areas should be designed to create a smooth transition from the public realm to the private realm. The following sections have a description, the goals, and design standards for each zone.

#### 4.3.4.1 Community Zone

<u>Description:</u> The community zone is one of the most important and most used areas of the Base. It is the area of the neighborhood open to travel by Base residents and visitors, mostly including the portion of the circulation system upon which housing units front. It includes the streets, planting strips, and sidewalks.

#### Goals:

- Provide efficient and safe access to all housing units and contribute to the neighborhood character while achieving the overall goals for the Circulation System (4.3.2).
- Use design techniques that balance vehicle and pedestrian needs.
- Provide an attractive aesthetic appearance throughout the neighborhoods.
- Minimize impervious surface runoff and make efficient use of all streets.
- Ensure safe vehicle speeds appropriate for residential neighborhoods.
- Seek a street layout that allows the greatest number of houses to have an energy-efficient exposure (see Part 3 Sustainable Design), without compromising the goals of the Circulation System (4.3.2) or the goals of the Streetscape Zone (4.3.4.2).
- Adapt street layouts to the terrain and minimize grading.

#### Standards and Guidelines:

Local street width: 32 feetThrough street width: 32 feet

Cul-de-sac radius: 30 to 45 feet (off –center turnarounds are acceptable to make

turning movements assist

turning movements easier)

Sidewalk Width 5 feet minimum – one side of the street. On any cul-de-sacs, the

sidewalk shall continue around the entire bulb of the cul-de-sac.

Betterment is 5-foot sidewalks on both sides of the street, except where a portion of the trail system provides equally convenient

pedestrian access.

Planting Strip (area between 4 feet minimum. Only grass, street lights, and mailboxes shall be back of curb and sidewalk):

allowed in the planting strip.

Curb radius at intersections 10 to 15 feet for intersections of local streets

15 to 20 for intersections with through streets or arterial streets

Mailbox Area A mailbox cluster shall be located within the clear line of site of the

> front door of all housing units that it serves. Mailbox clusters shall provide a cover for residents accessing mailboxes with a minimum 4' overhang from the face of the mailboxes. The cover shall be compatible with the architectural style and materials of the housing units in the neighborhood. (Note: Bus stops, as indicated in the 1999 Whiteman AFB Family Housing Community Plan are not

required as part of the neighborhood site design.)

Utility Area A 15-foot wide utility easement shall be located in the Community

> Zone to locate water, gas, and sanitary sewer facilities. The preferred location is on one side of the street without sidewalks, immediately behind the back of curb. In the case where the Betterment for sidewalks on both sides of the street is provided, the easement shall be in the planting strip (and under the sidewalk if

necessary) on either side of the street.

# 4.3.4.2 Streetscape Zone

**Description:** The Streetscape Zone is the portion of the neighborhood framed by the streets and housing units. Although it is typically considered a "private" yard area, it is visible from the streets and shares many of the characteristics of the Community Zone. Therefore, it establishes the transition from the Community Zone to the Private Zone. Front setbacks, front facades, building orientation, and landscape elements all contribute to the appearance of the Streetscape Zone.

# Goals:

- Create a consistent appearance that provides a visual sense of community. However, avoid uniformity of architectural features both along individual streets and between different areas of the neighborhood(s).
- Reinforce connections between the families and the community.
- Use design techniques to minimize interruptions caused by vehicle access, vehicle parking, and garage doors in the Streetscape Zone.
- Minimize impervious surface in the Streetscape Zone.

# Standards and Guidelines:

**Building Orientation:** All buildings shall orient towards the street with the front entry or porch facing the Community Zone.

Front facade building line:

The building line for the front façade shall be 30 to 40 feet from the back of curb. Front facade building lines along a single block shall not vary by more than 5 feet.

• Front setback for garage:

*Minimum* – Overhead garage doors facing the Community Zone shall have a garage building line at least 2 feet behind the front façade.

Alternative – garages with overhead garage doors facing a different direction from the front façade may have the same building line as the rest of the building (side, front, or rear).

Betterment –At least 33% of the units have either: (1) garages with overhead doors facing the Community Zone with garage building line at least 20 feet beyond the front building line; or (2) side or rear entry garages. Provided however, to achieve the betterment, the driveway paving width in the Streetscape Zone is minimized in conjunction with this design feature.

Garage doors:

When overhead garage doors for an individual housing unit in a duplex face the Community Zone, they shall not be located immediately adjacent to overhead garage doors for the attached adjacent unit.

*Minimum* – separate garage doors of individual housing units in the same structure by at least 40 feet.

Vehicle access:

All units shall have a paved vehicular access to two-car garages. However innovative site design techniques that minimize impervious surface in the Streetscape Zone are encouraged to meet the goals for the Streetscape Zone.

Pedestrian Access:

Each housing unit shall have a direct pedestrian connection from the front door to the street and from the front door to any parking area serving the unit.

• Facade/Housing design:

Within each fiscal year of construction (i.e. FY03, FY04, etc.) submit at least 4 different floor plans for 3-bedroom units and at least different 3 floor plans for 4-bedroom units. The same floor plans may be used in each fiscal year to meet this requirement. To qualify as a different floor plan, the unit shall have a different layout that results in different front facade wall planes or rooflines. Mirror image floor plans are acceptable but shall not count as different floor plans. An ADA accessible unit shall also qualify as a different floor plan. Neighborhood site plans shall designate which floor plan is proposed for each site.

At least 3 different floor plans shall be provided on each street. No more than 40% of all units in a task order may be of a single floor plan.

At least 2 material palettes shall be submitted for each floor plan. Example: One materials palette of brick with siding and another materials palette of stone with siding.

At least 2 color palettes shall be submitted for each material scheme. Example: A "brick" materials palette would have one light brick color scheme and one dark brick color scheme.

A materials and color board shall be submitted with all proposed material and color schemes.

No more than 60% of all buildings in a single task order can be of a single materials palette.

No more than 40% of all buildings in the task order can be of a single color/material combination.

In all cases, changes of materials of "field" colors or materials should occur at inside corners, and not at outside corners or in the middle of a facade. (See Figure 4.3.2)

Front porch design

Covered front porches are required on all housing units. A front porch shall include a total area capable of accommodating 4 chairs and 2 accessory tables.

Front porch depth shall be a minimum of 6 feet deep with 8 to 10 feet being desirable. Front porches meeting these standards may encroach into the setback required for the front façade building line.

## 4.3.4.3 Private Zone

<u>Description</u>: The Private Zone of the Neighborhood Design is largely made up of the internal housing unit, and more detailed specifications are contained in Part 9 – Unit Design. However, some details of this area involve external elements such as side setbacks, rear yards, fencing and screening.

#### Goals:

- Promote visual diversity and a variety of configurations of housing units.
- Promote building footprints suited to varying terrain, and encourage layouts that maximize natural or inherent backyard screening.
- Provide the best views and privacy for occupants of housing units.
- Encourage vehicle parking, including garages, overhead garage doors, additional exterior parking in the Private Area of the site.
- Maintain a separation between the rear of buildings of 120 feet wherever possible, or provide access to open space, natural areas, or recreation areas for residents.

## Standards and Guidelines:

• Side building separation:

Buildings along a single block shall be separated by at least 16 feet. In cases where drainage swales are required for proper drainage between sides of buildings, buildings shall be separated by at least 20 feet with the centerline of the swale located in the center of the side separation.

The side separation along a single block should generally not exceed the front setback.

Designs, materials, and window locations on side facades shall ensure privacy within units, but should avoid large expanses of blank walls.

• Rear building separation: Buildings shall maintain a minimum rear separation of 100 feet from the

rear of another building or the back of the curb of another street. This separation may include "no build" areas shown on Figure 4.3.1 – Conceptual Land Use Map. Patios and fenced yards may encroach into

the rear separation but not into a "no build" area.

Force Protection: No building may be located within 45 meters of the controlled access

perimeter fence bordering the Development Area.

Fences: Fencing is prohibited in the front or on the side of buildings.

A fenced area shall be provided for the rear yard of all units subject to the following:

- the fenced area shall be between 1200 and 2000 s.f.;
- the minimum dimension of the fenced area in any direction shall be 24 feet:

- 2 personnel gates (at least one of which is at least 36 inches wide) are required for each fenced area;
- fences shall connect to the privacy screen (see Part 9);
- common fences between adjacent units and adjacent buildings are allowable.

• Utility Location:

A 20-foot utility easement shall be located in the Private Zone for electric, telephone, and cable facilities. This easement may be allocated equally between the Private Zone or rear-adjacent units. As an alternative, this utility easement may be located in a Common Interior Zone where provided.

# 4.3.4.4 Common Interior Zone (optional)

<u>Description</u>: The Common Interior Zone is internal to the block and may be accessed by residents around the exterior of the block. This zone is optional and may be planned to locate playgrounds, tot lots, open space, and trail elements of the Development Plan.

# Goals, Standards and Guidelines:

#### Refer to:

- Section 4.3.2. for general recreation and open space goals;
- Section 4.3.5 for playground and tot lot goals and standards; and
- Part 7 for landscaping standards.

## 4.3.5 OPEN / RECREATION SPACE DESIGN

Offerors shall submit a site design plan for all open space and recreation space in the FY03 task order and Option 1, FY04 Project. The site design for each area shall meet the general planning goals for open/recreation space specified in Section 4.3.2 – Land Use and Planning, as well as the detailed site design goals and standards of this section.

#### 4.3.5.1 Playgrounds and Tot lots

# Goals

- Provide direct access to natural undeveloped open space for all residence either through adjacency of
  residents to undeveloped open space or access to a trail system that connects to undeveloped open
  space.
- Design playgrounds and tot lots that provide development and stimulation through a variety of the following activities: motor skills; imagination; building; competition; and quite solitary activities. Do not segregate these activities in separate play areas, rather link them through integrated site design.
- Tot lots should be designed for 2 to 5 year olds and accommodate approximately 15 children.
- Playgrounds shall include a tot lot, and in addition contain a play area designed for children 5 to 12 years old. The additional play area should accommodate approximately 25 children.
- All tot lots and playgrounds throughout the Development Area should not be the same in terms of design and play equipment.

## Standards and Guidelines

Location and Size

Elements

Tot lots, playgrounds, trails, and open space shall be located according to the general planning goals specified in 4.3.2.

Tot lots shall include a play area of approximately 1,500 square feet.

Playgrounds shall include a play area of approximately 3,500 feet.

Tot lots and playgrounds should provide some residual open space for unstructured play. This area may be counted as undeveloped open space for the purposes of meeting the open/recreation space planning goals in Section 4.3.2.

Tot lot locations should be visible from most residences which it serves.

Tot lots shall include at least the following elements:

- A 2 child swing (minimum 8' high);
- At least 1 climbing apparatus with a slide;
- At leas 3 different additional activity stations that provide a variety of physical and mental stimulation meeting the specified design goals.
- At least 2 benches for adult seating;
- 1 trash receptacle;
- An edge treatment defining the play area.

Playgrounds shall include at least the following elements:

- All of the elements listed for tot lots in a distinct but adjacent play area;
- Swings for 4 people (minimum 12' high);
- At least 1 climbing apparatus with at least 2 slides;
- At leas 5 different additional activity stations that provide a variety of physical and mental stimulation meeting the specified design goals.
- At least 3 benches for adult seating;
- 2 trash receptacles;
- 1 covered pavilion (minimum 16' by 16' column separation);
- 2 picnic tables;
- 1 bar-b-que grill;
- 1 bike rack accommodating at least 10 bicycles.
- An edge treatment defining the play area. (See Figure 4.3.5.1 for detail of edge treatment currently used at Whiteman AFB. This is the recommended edge treatment, however treatments meeting similar or improved performance standards are acceptable.)

• Landscape

Sufficient excess area around the play area shall be provided for access, supervision, and unstructured play.

Playgrounds and tot lots should be located to take advantage of existing trees for shade. Refer to Part 7 – Landscape for materials and specifications regarding open / recreation space.

Access

All playgrounds and tot lots shall be directly accessible to all residences which it serves by a sidewalk or trail meeting the goals and specifications for the Circulation System

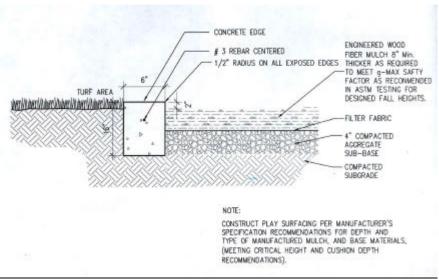


Figure 4.3.5.1. - Play Area Edge Detail

## Design Specifications, Child Safety, and Accessibility

Playgrounds and tot lots shall comply with the safety requirements of ASTM and the Handbook for Public Playground Safety (US Consumer Reports Safety Commission).

Accessibility to children and adults with disabilities: Play areas shall be accessible to children and adults with disabilities. In addition to wheelchair users, the needs of children and adults who walk with canes, walkers, or crutches; who have limited use of the upper body; who have visual or hearing disabilities, or who have developmental disabilities shall be considered. Design criteria based on child dimensions should be used for the proper functioning of the play area. Every part of a play area may not be accessible to all its users, but the social experience provided should be accessible to everyone. When more than one play activity of the same type is provided, one shall be accessible. When one activity is provided, it shall be accessible. A diverse play area has the greatest potential for meeting the needs of all users. Separate play areas for the physically challenged are not acceptable. Integrating all children in the same play setting is emphasized. Standard ADA guidelines for accessible routes, ramps for wheelchair access, transfer points, wheelchair accessible platforms, and accessible stepped platforms should be followed.

Age appropriate scale is a term used to describe equipment which will allow safe and successful use by children of a specific chronological age, mental age, and physical ability. Play equipment height and complexity shall not exceed the user's ability. The children's play areas shall meet age appropriate scale for the age groups that the areas are designed to accommodate.

Use zones. In accordance with ASTM F 1487. a use zone is a clear, unobstructed area under and around play equipment where a child would be expected to land when jumping or falling from a piece of play equipment. Requirements for use zones vary for the age group and for different pieces of equipment. All use zones for play equipment shall be shown on the site plan to ensure there is no conflict between play activities on the ground and swinging or jumping from the equipment. Use zones will not overlap except for spring rocking equipment, balance beams, and play houses.

Playground safety surface. A playground safety surface is constructed of a material that meets the shock absorbency criteria recommended in ASTM F 1292, F1951, and F 2075. Playground safety surfaces shall be provided throughout all use zones and under all play equipment as required by the ASTM. The preferred material is wood chips similar to Fibar.

The following play events are not appropriate for use in unsupervised play areas; Chain walks, chain or tire climbers, fulcrum seesaws, log roles, May poles, merry-go-rounds, rotating equipment, spring rocking equipment intended for standing, swinging exercise bars, trapeze bars, and whirls.

#### 4.3.5.2 Trail

#### Goals

- Provide direct access to natural undeveloped open space for all residence either through adjacency of
  residents to undeveloped open space or access to a trail system that connects to undeveloped open
  space.
- Follow the general trail location criteria and principles in the February 1999 Whiteman AFBfamily Housing Community Plan.
- Establish links between playgrounds, open space, and the pedestrian Circulation System with the trail system.
- Create a looped trail system, minimizing "dead end" portions of trails.
- Trails may be located in the 45 meter Base perimeter setback and the Conservation Areas on the Conceptual Land Use Map.

# Standards and Guidelines

- A minimum 10' wide paved jogging/walking/bike trail shall be provided.
- Match trail system design with existing Whiteman AFB trail system. (See Figure 4.3.5.2.a. and b. for
  the trail section and edge detail currently used at Whiteman AFB. This trail design is recommended,
  however specifications meeting similar or improved performance standards and blending seamlessly
  with the existing trail system are acceptable.)

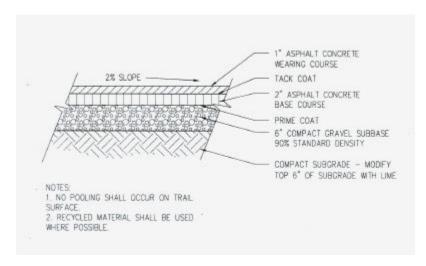


Figure 4.3.5.2.a. – Asphalt Trail Section

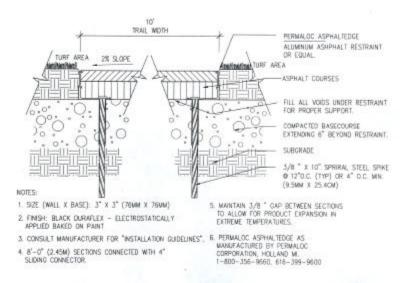


Figure 4.3.5.2.b. - Asphalt Trail Edge Detail

# 4.4 CONSTRUCTION SPECIFICATIONS

#### 4.4.1 GENERAL

Refer to Part 6 – GRADING, DRAINAGE, AND EROSION CONTROL, for additional information on sidewalk criteria.

# 4.4.2 CONCRETE AND ASPHALTIC CONCRETE

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Refer to the following technical specification sections included in Division 2 of this RFP for additional information on concrete and asphaltic concrete:

Section 02/00	Asphaltic Concrete
Section 02712	Lime-Modified Subgrade
Section 02714	Rapid Drainage Layer
Section 02721	Subbase Coursed
Section 02722	CrushedBase Course
Section 02748	Bituminous Tack and Prime Coats
Section 02760	Field Molded Sealants in Rigid Pavements
Section 02763	Pavement Markings
Section 02770	Concrete Sidewalks

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- All curb and gutter shall be constructed of concrete. Asphalt curbs shall not be used. Curbs shall be depressed at entrances to driveways and at all other areas where ramping for vehicular or pedestrian access is provided. Curb ramps shall be provided wherever an accessible route crosses a curb including intersections, pedestrian crossings, mail boxes, playgrounds, parks, and recreational areas. Accessibility shall be considered for bike riders, strollers, and persons with disabilities. All gradients shall provide positive drainage (no ponding). Expansion joints in concrete sidewalks shall be sealed with cold-applied sealant, which is gray in color.
- All existing curb and gutter that is required to be removed shall be replaced to match existing adjacent profiles.
- Walks shall be of reinforced concrete with a minimum nominal thickness of four (4) inches and have a medium broom finish. Walks shall be placed over four (4) inches of aggregate base course. Walks accessing handicapped entrances shall meet the requirements of the American Disability Act with

respect to width and grade. Curb cuts shall be provided for handicapped accessibility at intersections of drives and walks. Transverse contraction joint spacing shall be five (5) feet for walks five (5) feet wide. Longitudinal contraction joints shall be constructed in sidewalk widths eight (8) feet and greater. Expansion joint spacing shall not exceed forty (40) feet.

- All existing sidewalks that are required to be removed shall be replaced to match the existing adjacent sidewalk to remain including size, layout, thickness, contraction joints, expansion joints, toolings and brooming. Where new utilities will be installed using open trench methods, existing sidewalks shall be removed to the nearest joint and replaced to original thickness and cross section. Concrete sidewalks shall be a minimum of four (4) inches thick.
- Thickness of aggregate base course shall be 6" or as recommended by the soils tests and shall be installed over 6" compacted subgrade.
- Where new utilities will be installed using open trench methods, existing pavements shall be removed and replaced to original thickness and cross section. Bituminous and concrete pavements shall overlap at least twelve (12) inches over existing base course.

#### 4.4.3 DRIVEWAYS

Driveways shall slope down from the garage with an algebraic difference of grades at any one point not greater than 6 percent, 2 percent cross-slope. The minimum pavement section for driveways shall be 6 inches of reinforced concrete over 4 inches of aggregate base course over 6 inches compacted subgrade.

#### 4.4.4 TRAFFIC CONTROL AND STREET SIGNS

Traffic control signs shall be provided at all street intersections and shall conform to requirements of Airforce Family Housing Guide. Street name signs shall be provided at all street intersections and shall conform to appropriate base standards. The Contracting Officer will provide street names. Details of the street name signs, including mounting details, shall be submitted to the CO for approval.

#### **4.4.5 FENCES**

# 4.4.5.1 Controlled Access Perimeter Fence

A controlled access perimeter fence shall connect to the existing fence and be located approximately on the property line. The fence shall be a 7 foot chain link with a top and bottom tension line, three barbed wire outrigger, centered on a 12" wide, 4" deep mow strip consisting of gravel over weed control fabric.

## 4.4.5.2 Rear Yard Fence

The rear yard fences shall meet the following specifications:

- conform to the requirements ASTM F964;
- solid wall virgin PVC compounds;
- contain no co-extruded products;
- 48" fence height;
- minimum 5" x 5" fence posts located a maximum of 8 feet on center with post caps;
- minimum non-prorated 20 year warranty;

The fence style shall be compatible with the character of each individual neighborhood and shall meet the approval of Whiteman AFB. (Refer to Part 9 - Housing Unit Design/Construction for additional information of privacy screens between adjoined units.)

# 4.5 SUBMITTAL REQUIREMENTS

## 4.5.1 DEVELOPMENT PLAN

☐ Prepare plan drawn to scale of 1"= 300' or larger and including north arrow and graphic scale.

	Name of the project, Offeror who developed the plan and the date.
	Show boundaries with dimensions and written legal description of site.
	Location of Public right-of-ways adjacent to the property.
	Location of any/all easements on the property.
	Show general building locations.
	State the total number of units provided in the Development Plan
	Show general location of streets, sidewalks, trails, fences, playgrounds, and any retaining walls.
	Show plan of the entire development area, and indicate development phases.
	Show any sign locations.
	Show relationship between Neighborhoods, Circulation System, Open/Natural Space including any areas designated for special transition design treatment.
4.5.	2 NEIGHBORHOOD SITE DESIGN PLAN
	Prepare plan(s) drawn to scale of 1"= 100" or larger and including north arrow and graphic scale for the FY03 (92 Units) and FY04 (100 Units) project sites.
	Name of the project, Offeror, and the date of the plan.
	Show boundaries with dimensions and written legal description of site.
	Note on plan boundary of 100-year regulatory flood plain and floodway.
	Location of Public right-of-ways adjacent to the property.
	Location of all easements on the property.
	Show building locations with floor plan or building type designation.
	List the type, thickness, location and width of all pavement surfaces, show a "typical" detail for all driveways, walkways, trails and residential and through streets.
	Dimension typical distances between buildings, setback from streets, street widths, sidewalks, and driveways.
	Show location, height and material of any and all screen walls, retaining walls and fences.
	Show direction and height and location of all proposed street and pedestrian lighting facilities.
	Show the proposed location, dimensions, color, materials, and elevation of any exterior signs.
	Show the location of all other improvements to be built under the particular task order.



FIG. 4.3.1

CONTOUR INTERVAL = 2'

Summit Drive

- 1 Conservation Area
  - No Work
- **2 Conservation Area** 
  - No Housing
- 3 Recreation & Access - No Housing
- 4 Future Single-Family
- SOQ Housing, Task Order

**Points** New Through **New Residential** Street SECESS New Trail **Connection Corridor** 



# <u>PART 5 – SOILS AND SUBSURFACE CONDITIONS</u>

# **INDEX**

5	SOILS	AND SUBSURFACE CONSIDERATIONS	2
		IL AND FOUNDATION REPORT (GEOTECHNICAL REPORT)	
		OTECHNICAL ANALYSIS	
	5.2.1	Site Specific Concerns	2
	5.2.2	Soil Compaction	
	5.2.3	Capillary Water Barrier and Vapor Barrier	
	5.2.4	Soil Treatment	3
	5.2.5	Decay Treatment	
	5.2.6	Radon Mitigation	

# 5 SOILS AND SUBSURFACE CONSIDERATIONS

# 5.1 SOILS REPORT AND SUPPLEMENT (GEOTECHNICAL REPORT)

A Soils Report, dated 1995 and revised May 2003, and a Supplement Report, dated May 2003, is provided as part of this RFP (See Attachments). The Report and Supplement are intended to provide an overview of soils and geologic conditions encountered at the Development Area. Refer to Appendix A in the Soils Report for a Boring Map which shows where soil testing was accomplished. The Supplement report must be read and interpreted in conjunction with the original Soils Report including revisions. References to the "Designer" and "Contractor" in the Reports and herein are synonymous with "Offeror".

The attached Soils Report and Supplement are intended to provide geotechnical criteria for the Development Area for use by the Offeror in preparing the Proposal. Any errors identified shall be brought to the attention of the Contracting Officer immediately for resolution and direction. The Contractor shall take all professionally prudent and reasonable actions to verify the accuracy of the data provided. During design and construction, the Contractor shall, with his or her consulting professional geotechnical engineer experienced in geotechnical engineering, be responsible for obtaining any additional data necessary for the execution of this project.

## 5.2 GEOTECHNICAL ANALYSIS

## 5.2.1 SITE SPECIFIC CONCERNS

- a) The clay soils at Whiteman AFB present the greatest problems for construction in general. Often the in-situ moisture content of the clays are near the plastic limits thus indicating a potential for volume change with changes in moisture content. Potential swell for this type of material is "high". Reference to the Soils Report is recommended to obtain specific information relative to expansive soil conditions.
- b) It should be realized that ground water levels at Whiteman AFB are often difficult to determine accurately during a relatively short field investigation; perched water conditions and low permeability soils can produce misleading levels within the borings. Accurate ground water data will be required for the design and construction of building foundations. It is suggested that if a structure is especially sensitive to ground water depth, a short-term piezometer installation is a good indicator of ground water conditions. Reference to the Soils Report is recommended to obtain specific information relative to ground water level conditions.

# 5.2.2 SOIL COMPACTION

- a) Soil compaction shall be achieved by equipment appropriate to the material type being compacted. Material shall be moistened or aerated as described in the Soils Report to provide the moisture content that will readily facilitate obtaining the compaction specified with the equipment used. Compact each layer to not less than the percentage of maximum density specified in Table 5-1, determined in accordance with ASTM D 1557 Method D.
- b) The requirements shall be verified or modifications recommended by the consulting professional geotechnical engineer in the report wherever engineering, soils, or climatic factors indicate the necessity. Any modification to the stated compaction requirements shall require the approval of the Contracting Officer.

TABLE 5-1 - SOIL COMPACTION

Subgrade Preparation, Fills, Embankments, and Backfills	Compaction Requirements (Percentage of Maximum Density)
Structures & Building Slabs	Per text of Soils Report
Streets, Paved Areas, Bike Paths	90
Sidewalks	85
Grassed Areas	85

# 5.2.3 CAPILLARY WATER BARRIER AND VAPOR BARRIER.

A capillary water barrier and vapor barrier is required for all interior slabs on grade, including garages, and crawl spaces. As a minimum, the vapor barrier shall be a polyethylene sheet not less than 6 mils thick. Provide crushed rock capillary water barrier below the vapor barrier per the Soils Report.

## 5.2.4 SOIL TREATMENT

Soil treatment for termites is required. Termiticides bearing current registration by the EPA or approved for such use by another the appropriate agency shall be used. Comply with 7 USC Section 136 for requirements on Contractor's licensing, certification and record keeping.

## 5.2.5 DECAY TREATMENT

Decay treatment shall be in accordance with HUD 4910.1.

# 5.2.6 RADON MITIGATION

Radon mitigation of the soil is not required. However, refer to Part 3 and Part 11 for radon prevention requirements.

# PART 6 - GRADING, DRAINAGE, AND EROSION CONTROL

# **INDEX**

6	GRADI	NG, DRAINAGE, AND EROSION CONTROL	2
	6.1 GR	ADING	2
	6.1.1	General	
	6.1.2	Grading Goals	
	6.1.3	Borrow and Waste	2
	6.1.4	Sidewalks and Curb and Gutter	
	6.1.5	House Floor Elevation	
	6.1.6	Grades Away From Houses	
	6.1.7	Overlot Grades	
		Paved Areas	
	6.1.8 6.1.9		
		Ditch Slopes	
		ORM DRAINAGE	
	6.2.1	General	
	6.2.2	Storm Drainage Goals	
	6.2.2.1	Engineering Criteria.	
	6.2.3	Determination of Storm Runoff	4
	6.2.3.1	Design Storm Return Frequencies	دک
	6.2.3.2 6.2.3.3	Rainfall Depth-Duration-Frequency Data	
	6.2.3		
	6.2.3		
	6.2.3		
	6.2.3	*	
	6.2.3		
	6.2.3		
	6.2.4	Storm Drain Pipe and Structures	6
	6.2.4.1	General	6
	6.2.4.2	Storm Drain Pipe	6
	6.2.4.3	Manholes	6
	6.2.4.4	Area Inlets	
	6.2.4.5	Curb Inlets	
	6.2.4.6	Head Walls and Flared End Sections	
	6.2.4.7	Culverts	
		OSION AND SEDIMENT CONTROL	
	6.3.1	Temporary Construction Entrance	
	6.3.2	Erosion Control Blanket	
	6.3.3	Silt Fence	
	6.3.4	Straw Bale Barrier	
	6.3.5	Outlet Protection	
	6.3.6	Storm Drain Inlet Protection	
	6.3.7	Rock Check Dam	
	6.3.8	Temporary Sediment Trap	
	6.3.9	Temporary Sediment Basin	8
	6.3.10	Other Controls	8
	6.4 CA	LCULATIONS AND DRAWINGS	8
	6.5 OFI	FER CHECKLIST FOR GRADING, DRAINAGE & EROSION CONTROL	8

# 6 GRADING, STORM DRAINAGE, AND EROSION CONTROL

#### 6.1 GRADING

#### 6.1.1 GENERAL

The Contractor shall complete all rough and final grading as necessary to complete all work included in this RFP. The Contractor shall confine all grading work, except utility connections / extensions as noted in Part 8, Site Utilities, to the Development Area boundaries indicated on Drawings included in this RFP. Existing Partial Topographic Site Plan information is shown on Drawings 6.1.1, 6.1.2 and 6.1.3 as included in this RFP. Refer to the Conceptual Land Use Map, in Part 4 for additional schematic site information. Refer to Part 7, Landscaping, for specific landscaping information as it relates to site grading. Clearing and grubbing on the site shall be as specified in Division 2 Technical Specifications in this RFP, Section 02230 CLEARING AND GRUBBING.

#### 6.1.2 GRADING GOALS

Site grading shall reflect the following characteristics:

- The design shall provide positive drainage away from all houses on all sides.
- Use existing terrain to minimize cut and fill.
- Street layout shall minimize need for extensive re-grading of site
- Earthwork shall be balanced to the greatest extent possible without compromising the design.
- Utilize natural drainage features wherever possible.
- Grading shall be properly coordinated with areas surrounding the Development Area to insure that runoff does not cause damage or problems to other properties.
- Removal of existing trees shall be kept to a minimum. No grading shall be done within drip lines of existing trees to be preserved.

#### 6.1.3 BORROW AND WASTE

Borrow materials shall be obtained from sources outside the limits of Government-controlled land. The source of borrow material shall be the Contractor's responsibility. The Contractor shall obtain from the owners the right to procure material, shall pay all royalties and other charges involved, and shall bear all the expense of developing the sources, including rights-of-way for hauling. The Offeror shall include any and all costs associated with obtaining borrow materials with Offer. Any surplus materials not required for fill shall be placed in the stockpile as designated by the Contracting Officer. Topsoil may be stripped from the building and road sites for reuse in final landscaping if it complies with the requirements of this RFP.

If borrow site requires coverage under a National Pollution Discharge Elimination System (NPDES) general permit for storm water discharges associated with construction activity, the Contractor shall comply with the requirements in UFGS Section 01355 ENVIRONMENTAL PROTECTION. The Contractor shall be responsible for assisting the Contracting Officer in obtaining all permit(s) required by the Missouri Department of Natural Resources (MNDR). The Contractor's responsibility shall include obtaining any required forms or applications, assisting in completing the same and paying of any applicable fees. A copy of the completed, final permit(s) shall be provided to the Contracting Officer for review prior to any work beginning. The Offeror shall include any and all costs associated with obtaining such permit(s) with Offer. The Contractor shall include a line item for permit submittals as part of the overall project schedule referenced in Section 01320 Project Schedule.

# 6.1.4 SIDEWALKS AND CURB AND GUTTER

Concrete walks shall have a maximum transverse grade of 2 percent (2%). Maximum longitudinal walk grade shall be 5 percent (5%). Handicapped accessible walks with a longitudinal slope greater than 5 percent (5%) shall be considered a ramp. See FED STD 795 Uniform Federal Accessibility Standards for ramp requirements. Special attention shall be given to sidewalks that are on the north (shaded) side of houses. These walks shall be designed to ensure a freeze/thaw cycle does not result in the formation of ice on the walk. Ice on walks should be a safety consideration for all areas. The use of steps in walks shall be avoided whenever possible. The use of

single riser step is prohibited. When steps are unavoidable, they shall have at least three risers and shall be provided with handrails. The maximum longitudinal slope of five percent (5%) shall not apply to walks along streets.

Sidewalks, curbs/gutters and exterior slabs shall be as specified in Division 2 Technical Specifications in this RFP, Section 02770 CONCRETE SIDEWALKS, CURBS AND GUTTERS, AND EXTERIOR SLABS. Curbs/gutters shall be Whiteman AFB standard "lazy-back" type conforming to Figure 6.1.4. Refer to Part 4, Site, for additional site criteria information.

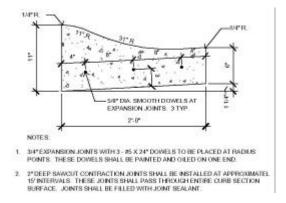


Figure 6.1.4 – Standard Whiteman AFB Curb and Gutter

## 6.1.5 HOUSE FLOOR ELEVATION

Finished floor elevations shall be set to ensure that the required minimum and maximum grades are met. Provide for a minimum of eight (8) inches of exposed concrete foundation wall above finish grade, except where entrances, particularly front entrances to accessible units, may require less foundation exposure directly at entrance. Refer to Part 10 for additional requirements for dimensions relating to foundation walls, finish grade and finish floor elevations. Provide minimum eighteen (18) inch difference between finish grade and front porches of non-accessible units, as well as between finish floor and the rear patio. In no case, shall the difference between finished floor elevation and finished grade be less than twenty-five (25) inches. Surface drainage shall flow away from each building. If a drainage swale is located between buildings the swale shall be centered between buildings with the centerline no closer than ten (10) feet to either building foundation. Drainage swale(s) will not be permitted in the front yard of buildings. If a drainage swale is located in the rear yard of a building, the centerline of the swale shall be no closer than forty (40) feet to the face of a foundation wall. Refer to Part 4, Site, for additional criteria regarding the siting and separation of buildings. Roof drains shall be directed onto splash blocks to prevent water that runs off the roofs from eroding the soil in planter areas around the house foundations. Refer to Part 9, Housing Unit Design / Construction, for additional information regarding roof drains. Ensure that foundation planting beds are designed to positively drain so that water will not pond next to the foundations.

#### 6.1.6 GRADES AWAY FROM HOUSES

a. Minimum of ten percent (10%) (10:1) for the first eight (8) feet.

#### 6.1.7 OVERLOT GRADES

Provide positive drainage for all areas.

- a. Minimum two percent (2%) (50:1) for unpaved areas.
- b. Maximum twenty percent (20%) (5:1) grade in unpaved areas with the exception of retention areas

# 6.1.8 PAVED AREAS

Provide positive drainage for all areas.

- a. Minimum two percent (2%) (50:1) for Asphaltic concrete areas.
- b. Minimum one percent (1%) (100:1) for Portland Cement concrete areas

#### 6.1.9 DITCH SLOPES

- a. Minimum grade of two percent (2%) (50:1) for channelized flow.
- b. All new ditches shall be graded at non-erodible slopes or the ditch shall be lined with an appropriate material to prevent erosion. A design storm with a return period of at least two (2) years shall be used to determine erodibility of ditches and swales.

## **6.2 STORM DRAINAGE**

## 6.2.1 GENERAL

The Contractor shall design and install a complete, usable, new storm drainage system for the new family housing in the Development Area. Existing Partial Storm Water Sewer information is shown on Drawing 6.2 as included in this RFP. Drainage structures shall be located at all changes in direction of storm drain line, at the intersection of two or more storm drain lines, and where required to intercept rainfall runoff. Storm runoff in streets with curbing shall be collected using curb inlets or area inlets. The use of curb openings with flumes to drain water from streets will not be permitted unless approved by the Government. Where storm drain pipes are of different diameters, the pipe crown elevations shall be matched at the drainage structure. Under no circumstance shall storm drain lines be located beneath buildings. The Contractor shall refer to the Corps of Engineers standard details for any storm drain details required by the design. The standard details are available at the Corps FTP site http://cadlib.wes.army.mil/DetailsLibrary/. The Contractor shall provide details for any other drainage structures not found in the Corps standard details.

## 6.2.2 STORM DRAINAGE GOALS

Storm drainage design shall capitalize upon the following characteristics:

- Existing water impoundments within the Development Area shall be utilized.
- The complete new storm drainage system shall be designed to minimize the number of drainage structures required.
- Storm drain lines shall be located outside of paved areas to the greatest extent possible.
- In no case shall storm water be directed off Government property by means of any newly designed storm sewer collection system including, but not limited to, swales, ditches, culverts and/ or pipes.
- Storm drainage lines shall be designed to have a minimum velocity such that the lines will be self-cleaning to eliminate the buildup of sediment.
- Temporary ponding on the site will be acceptable. However, temporary ponding of a depth of greater than three (3) inches or for a duration of more than an hour will not be acceptable.

#### 6.2.2.1 ENGINEERING CRITERIA

All civil work shall conform to the latest editions of the following:

- a. Standard Design Criteria of the American Public Works Association Kansas City Metropolitan Chapter (APWA)
- b. Missouri Department of Transportation (MoDOT) Standard Specifications and Details for work to be performed within the limits of the MoDOT right-of-way.
- c. The Johnson County, Missouri Public Works standard drawings for the civil work to be performed within the limits of the Johnson County, Missouri right-of-way.
- d. The Uniform Federal Accessibility Standards (UFAS).
- e. The Americans with Disabilities Act (ADA).

The most stringent requirements shall govern. All references to "City Engineer", "County Engineer", "District Engineer", etc. shall be inferred to mean "Base Engineer" or Government Official as applicable.

# 6.2.3 DETERMINATION OF STORM RUNOFF

For areas of up to about one (1) square mile (watershed less than six-hundred (600) acres), where only peak discharges are required for design and extensive ponding is not involved; the computation of runoff will be accomplished by either the Rational Method, SCS TR55 or the method presented in TM 5-820-1.

The following methods are acceptable for all watersheds (including those larger than six-hundred (600) acres):

SCS TR-55 SCS TR 20 HEC-1

The minimum time of concentration for turf or paved areas shall be five (5) minutes. All runoff onto the site from adjacent properties shall be included in the drainage calculations.

## **6.2.3.1** Design Storm Return Frequencies

Enclosed and open channel conveyance system components shall be designed for the following return frequencies in accordance with APWA Section 5601.8A.

a. Floodway in 100 year Flood Plain
 b. Cross-road culverts (including highways)
 c. Inlets, pipes, other system components
 100-year
 10-year

# 6.2.3.2 Rainfall Depth-Duration-Frequency Data

Rainfall data for states in the midwestern United States, specifically Missouri, shall be obtained from NOAA . Rainfall intensity-duration data developed by cities or regions may be used if available.

# 6.2.3.3 Storm Water Detention / Retention

Detention / Retention facilities shall be provided in accordance with APWA Section 5606. As noted in Storm Drainage Goals above, existing water impoundments within the Development Area shall be utilized. During the design process, the Contractor shall evaluate the existing impoundments to determine deficiencies and required modifications. Any modifications determined necessary to the existing water impoundment, relative to final development of the entire site, shall be completed during the initial phase of work. The Contractor shall include written reports of all findings, as so noted, in the design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN). The following items shall be included, but not be limited to, in this evaluation and submittal:

# **6.2.3.3.1** Freeboard

Both the existing and required freeboard shall be evaluated and any required modifications necessary to achieve the requirements of APWA Section 5606 shall be determined.

# 6.2.3.3.2 Outlet Control

The existing outlet control structure and overflow spillway shall be evaluated and any additional outlet structures or modifications to the existing facilities shall be included.

# 6.2.3.3.3 Water volume and depth

The existing water depths and volumes shall be evaluated to determine the modifications necessary to achieve the detention volumes required in APWA Section 5606.

# 6.2.3.3.4 Water Quality

Testing shall be performed to determine the quality of the existing impounded water. Because the surrounding watershed is comprised of agricultural property, testing shall include tests to determine the levels of any insecticides or pesticides that may be present. The Contractor shall include results of these tests in the design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN). The results derived from testing performed prior to construction shall serve as a benchmark. Additional testing shall be conducted monthly during the construction of the project and at the conclusion of the project to determine the impact of construction on the waters. The Contractor shall provide written reports of the monthly test results to the Contracting Officer for review. Written copies of all monthly and final test results shall be included in the Project closeout documentation.

#### 6.2.3.3.5 Sediment

Testing shall be performed to determine both the depth and the make-up of the existing sediment in the existing impounded waters. Because the surrounding watershed is comprised of agricultural property, testing shall include tests to determine the levels of any insecticides, pesticides and heavy metals that may be present. The Contractor shall include results of these tests in the design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN). The results derived from testing performed prior to construction shall serve as a benchmark. Additional testing shall be conducted monthly during the construction of the project and at the conclusion of the project to determine the impact of construction on the waters. The Contractor shall provide written reports of the monthly test results to the Contracting Officer for review. Written copies of all monthly and final test results shall be included in the Project closeout documentation.

# **6.2.3.3.6** Government Regulatory Issues

While FEMA does not map the waterways within the current boundary of the Base, a large portion of the Development Area falls outside limits of the excluded property. The Contractor shall perform an examination of the Flood Insurance Rate Map (FIRM) for Johnson County to determine if any of the subject tract is identified as being in a flood hazard. It will also be necessary to be determine if any of the subject property has been classified as a Clean Water Act jurisdictional wetlands or falls under any requirement of the 404 lands. In addition, field investigations shall be conducted to determine if any evidence of "Endangered Species" exist. The Contractor shall also determine if the existing dam, or any new proposed dam(s), are governed by the Missouri Department of Natural Resources Rules and Regulations of the Dam and Reservoir Safety Council. Successful Contractor shall include results of all aforementioned examinations, investigations and subsequent determinations in the design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN).

#### 6.2.4 STORM DRAIN PIPE AND STRUCTURES

#### **6.2.4.1** General

The maximum distance between drainage structures shall be approximately three hundred (300) feet for conduits less than thirty (30) inches in diameter. The maximum distance between drainage structures shall be approximately five-hundred (500) feet for conduits thirty (30) inches and greater in diameter. Where possible, a minimum drop of two-tenths (0.2) feet between inverts of equal diameter storm drain pipes shall be provided at the centerline of drainage structures. Culverts and storm drains shall be protected by a minimum of three (3) feet of cover during construction to prevent damage before permitting heavy construction equipment to pass over them. All storm drain pipe and structures shall be as specified in UFGS Section 02630 STORM-DRAINAGE SYSTEM.

## 6.2.4.2 Storm Drain Pipe

Storm drainage material shall be PVC, PE, RCP or CMP. VCP or asbestos cement piping shall not be used. Minimum size for any storm main shall be twelve (12) inches. CMP shall be minimum twelve (12) gage. Reinforced concrete pipe shall be a minimum Class III. All pipe material shall have a minimum design service life of fifty (50) years. As a minimum, all pipe joints shall be soil tight. It is preferable that all pipe joints be silt-tight. Flexible resilient pipe connectors shall be provided at drainage structures when the water table is at or above the pipeline.

# **6.2.4.3** Manholes

Diameter of manholes shall be large enough to accommodate pipes entering/exiting the manhole. Manhole cast iron frames shall have a minimum opening diameter of twenty four (24) inches. Manhole structures shall be prohibited from having any form of ladder rungs installed in the interior.

# 6.2.4.4 Area Inlets

Area inlets shall be properly sized and designed to accommodate the design flows. Grating shall be of "Bicycle - Safe" design.

#### **6.2.4.5** Curb Inlets

Locating curb inlets at driveway entrances and on street corners (within limits of curb returns) will not be permitted. Curb inlets along two-lane streets shall be spaced and sized so that the flow in the gutter and ponded areas at low points does cover the crown of the street. Inlets and grating areas in the sag of vertical street curves that act as sumps shall be oversized one-hundred percent (100%). Curb inlets shall be equipped with trash guards.

#### 6.2.4.6 Head Walls and Flared End Sections

Head walls or flared end sections shall be provided at the ends of culverts and at storm drain outfalls. Protection from erosion and scouring at head wall and flared end section outfalls shall be as described herein.

#### **6.2.4.7** Culverts

Cross road culvert pipes not connecting two (2) drainage system structures shall have a minimum diameter of eighteen (18) inches wherever possible.

## 6.3 EROSION AND SEDIMENT CONTROL

The Contractor shall be responsible for selecting and implementing Best Management Practices (BMPs) to minimize pollutants in storm water discharges associated with construction activity at the construction site. BMPs shall conform to UFGS Section 01356 STORM WATER POLLUTION PREVENTION MEASURES. The Contractor shall prepare a plan describing the measures to be used for temporary erosion and sediment control required during the construction. This plan shall be included in the design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN). The Contractor shall maintain all erosion and sediment measures and other protective measures in effective operating condition. All temporary structural practices shall be removed once the corresponding disturbed drainage area has been permanently stabilized. If the project requires coverage under a National Pollution Discharge Elimination System (NPDES) general permit for storm water discharges associated with construction activity, the Contractor shall comply with the requirements in UFGS Section 01355 ENVIRONMENTAL PROTECTION. The Contractor shall be responsible for assisting the Contracting Officer in obtaining all permit(s) required by the Missouri Department of Natural Resources (MNDR). The Contractor's responsibility shall include obtaining any required forms or applications, assisting in completing the same and paying of any applicable fees. A copy of all completed, final permit(s) shall be provided to the Contracting Officer for review prior to any work beginning. The Offeror shall include any and all costs associated with obtaining such permit(s) with Offer. The Contractor shall include a line item for permit submittals as part of the overall project schedule referenced in Section 01320 Project Schedule.

# 6.3.1 TEMPORARY CONSTRUCTION ENTRANCE

Tracking of mud from the construction site onto adjacent roads and streets shall be kept to a minimum. A temporary stabilized stone pad shall be constructed at points where vehicular traffic will be leaving the construction site and moving directly onto a paved road or street. It shall extend the full width of the vehicular ingress and egress area and have a minimum length of seventy (70) feet. The entrance shall be maintained in a condition that will prevent tracking or flow of mud onto adjacent roads or streets. If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the stone, the tires of the vehicles shall be washed before entering the road or street. Any mud which is tracked onto roads or streets shall be removed at least once daily.

#### 6.3.2 EROSION CONTROL BLANKET

Bottoms and sideslopes of ditches and any other disturbed slopes one (1)V on three (3)H or steeper shall be covered with an erosion control blanket immediately after seeding.

#### 6.3.3 SILT FENCE

Silt fencing shall be installed below disturbed areas where erosion would occur in the form of sheet and rill erosion. The size of the drainage area above the silt fence shall not exceed one fourth of an acre per one-hundred (100) feet of silt fence length. Silt fencing may be installed across ditches only when the maximum contributing

drainage area is not greater than 1 acre. Silt fence constructed across a ditch shall have wire support and shall be of sufficient length to eliminate endflow.

#### 6.3.4 STRAW BALE BARRIER

Straw bale barriers may not be installed across ditches.

#### 6.3.5 OUTLET PROTECTION

HDPE geo-grid or porous concrete paving materials shall be installed at outlets of culverts and storm drains as needed to prevent erosion. The use of rip-rap materials will not be permitted.

#### 6.3.6 STORM DRAIN INLET PROTECTION

Storm drain inlet protection shall be installed around all new drain inlets that will become operational before permanent stabilization of the corresponding disturbed drainage area has occurred. Storm drain inlet protection shall include either a sediment filter or an excavated area around the storm drain inlet.

#### 6.3.7 TEMPORARY ROCK CHECK DAMS

Rock check dams may be installed in ditches that drain two (2) to ten (10) acres. The allowable drainage area will be dependent on the gradation of the rock used to construct the check dam. The maximum height of the dam shall be three (3) feet. The center of the dam shall be at least six (6) inches lower than the outer edges. For added stability, the base of the check dam may be keyed into the soil approximately six (6) inches. The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

## 6.3.8 TEMPORARY SEDIMENT TRAP

Temporary sediment traps may be constructed below disturbed areas where the total drainage area is less than three (3) acres.

#### 6.3.9 TEMPORARY SEDIMENT BASIN

Temporary sediment basins may be constructed below disturbed areas where the total drainage area is equal to or greater than three (3) acres.

#### 6.3.10 OTHER CONTROLS

Other temporary controls such as diversion dikes, level spreaders, seeding, etc. may be used if deemed necessary by the Contractor.

# 6.4 CALCULATIONS AND DRAWINGS

The Contractor shall prepare final drawings for the finish grading with a contour interval of one (1) foot. All drainage swales and ditches shall be provided with controlling invert elevations at the beginning and at all grade breaks, including drainage swales around buildings. Details of all storm structures shall be shown on the final contract drawings including typical sections for all drainage swales and open channels. All final design drawings, details, calculations, etc. shall be included in the design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN).

# 6.5 OFFER CHECKLIST FOR GRADING, DRAINAGE & EROSION CONTROL:

The Offeror shall include with Offer the following items as a minimum. Refer to Part 4 – Site Plan Checklist for "overlap" with Grading, Drainage & Erosion Control requirements.

o Prepare conceptual Site Grading and Drainage plan for entire Development Area drawn to scale of 1"=300" or larger with North arrow, graphic scale, name of project, name of Offeror and date of Plan.

- o Prepare detailed proposed Site Grading and Drainage plan drawn to scale of 1"=100' or larger for FY03 Task Order and FY04 Option 1 to Task Order project sites, with North arrow, graphic scale, name of project, name of Offeror and date of Plan.
- Detailed Site Grading and Drainage Plans shall include existing topography and proposed contours at no more than two (2) foot intervals. Benchmark information shall be to USGS datum.
- O Submitted drawings shall show proposed building and street locations on all plans. Detailed plans shall include proposed finish floor elevations for each structure.
- O Determine existing and anticipated final values of site stormwater run-off and provide documentation to show the same.
- o Determine anticipated Storm water volumes for Detention / Retention for entire site and provide documentation to explain . Include proposed outlet control measures for same.
- Describe measures to be used for temporary erosion and sediment control during all phases of construction.
- o Show proposed location of Temporary Construction Entrance on drawings submitted.

# PART 7 – LANDSCAPE

# **INDEX**

7	LANDS	CAPE	2
	7.1 GEN	ERAL	2
	7.2 TRE	E PRESERVATION PLAN	2
	7.3 LAN	IDSCAPE REQUIREMENTS	2
	7.3.1	Community Zone (refer to part 4 site planning)	3
	7.3.2	Streetscape Zone	
	7.3.3	Private Zone	
	7.3.4	Common Interior Zone	3
	7.3.5	Recreation Areas (including tot lots and playgrounds)	3
	7.3.6	Xeriscape	3
	7.4 LAN	IDSCAPE MATERIALS	
	7.4.1	<i>Trees</i>	4
	7.4.2	Shrubs	4
	7.4.3	Ground Cover	4
	7.4.4	Mulch	4
	7.4.5	Edging	4
	7.4.6	Soil Test	4
	7.4.7	<i>Top-Soil</i>	4
	7.4.8	Percolation Test	5
	7.4.9	Plant Installation	5
	7.4.10	Landscape Maintenance	5
	7.4.11	Landscape Establishment Period	5
	7.4.12	Unhealthy Plants	5
	7.4.13	Landscape Warranty	5
	7.5 SEE	DING AND SODDING	5
	7.5.1	Soil Preparation	5
	7.5.2	Seeding	5
	7.5.3	Sodding	6
	7.5.4	Turf Installation	6
	7.5.5	Turf Protection	6
	7.5.6	Turf Maintenance	6
	7.5.7	Turf Establishment Period	7
	7.5.8	Satisfactory Stand of Turf	7
	7.5.8.1	Seeded Yard Area	
	7.5.8.2		
	7.5.8.3	Sod Areas	. 7

# **LANDSCAPE**

## 7.1 GENERAL

Landscape design is an essential element in establishing the neighborhood identity for the housing project. The landscape design shall be integrally developed with the site planning and building layout to ensure efficient use of the land and space provided. Landscape plans shall be developed by a registered landscape architect, experienced in site planning, planting design, sustainability and familiar with local conditions and plant species who will provide all of the necessary landscape elements compatible with all architectural and site features.

Landscape requirements are as follows:

- Ensure long-term high standards of aesthetics, maintainability, and function.
- The overall landscape challenge shall be to high standards while minimizing the irrigation requirement for landscaping.
- The Contractor shall be responsible turf and irrigation system care and maintenance for a minimum of three months after date of final acceptance.
- All Trees, shrubs, ground cover and related materials shall be warranted and maintained for a period of one year after final date of acceptance.
- All turf areas shall be established and maintained until acceptance or occupancy, not to
  exceed three months.
- A list of landscape materials acceptable for use at Whiteman AFB is provided in the Whiteman AFB Landscape Development Plan.
- All Plant material shall be planted the following minimum distances from any foundation wall: Large Trees 12' Ornamental trees 8'

Shrubs 4'

## 7.2 TREE PRESERVATION PLAN

The Successful contractor shall provide a Tree Preservation Plan to address protection and maintenance of all existing trees of healthy character over 2-inch caliper when measured 4.5 feet above the ground. Protection of all other existing healthy vegetation and smaller trees is desirable where possible. A Tree Preservation Plan shall be prepared in accordance with the following:

- A registered landscape architect, licensed forester, or certified arborist shall prepare plan.
- Plan shall include all materials, labor, and equipment to be provided by the Contractor for tree
  protection and preservation prior to, during, and following demolition activities.
- Plan shall clearly describe proposed methods and treatments including plans, details and specifications, as needed, to identify trees and natural areas to be preserved.
- All existing trees that are preserved, protected and maintained by the Design/Build Contractor shall be warranted for a minimum of one calendar year following date of acceptance or occupancy.
- Demolition and/or Grading shall not commence until the Government has reviewed and approved the Tree Preservation Plan.

# 7.3 LANDSCAPE REQUIREMENTS

The Offeror shall develop a Landscape Planting Plan following the guidance of the Air Force Family Housing Guide and information herein. The plan shall reflect appropriate groupings, and tree plantings to define open spaces, streets, and residences, plantings should also be used to buffer and screen views, noise, and wind to ensure a complete project. No trees should be planted directly on top of an underground

utility. Where new housing is to connect to existing neighborhoods, transition plantings to be compatible with the adjacent neighborhood and provide additional landscaping to identify the entry.

Choose plant materials based on hardiness, climate, soil conditions, maintenance, quality, seasonal affect, and appropriate use. Landscape plans shall describe all plant material and size, soil preparation, and final grading. The following principles should be incorporated in the landscape plans:

#### 7.3.1 COMMUNITY ZONE (REFER TO PART 4 SITE PLANNING)

• All landscape areas to be lawn.

## 7.3.2 STREETSCAPE ZONE

- Provide 1 large tree (2" caliper minimum) for every 40 linear feet of street frontage measured along the back of curb. *Note: 2 1/2" caliper trees may be used at a per 50 linear foot provision.*
- Reference section 4.3.4.1 for acceptable locations
- Provide 2- medium or ornamental trees per unit.
- Provide mulched shrubs/perennial groupings to partially screen utilities and foundations and provide seasonal interest at entries and views from the residence.
- All other landscape areas to be lawn.

#### 7.3.3 PRIVATE ZONE

- Provide 1 large tree per unit. Where possible locate tree to shade decks, patios, driveways, and front entries.
- Provide 2 medium or ornamental or evergreen trees per unit to define and provide scale for patio.
- Provide mulched shrubs/perennial groupings to add seasonal interest, shade, define edges and provide scale for patio.
- Provide mulched shrubs/perennial groupings to partially screen utilities and foundations and provide seasonal interest at entries and views from the residence.
- All other landscape areas to be lawn.

#### 7.3.4 COMMON INTERIOR ZONE

- Provide 1 large tree per unit.
- Provide 1 evergreen tree per unit.
- All other landscape areas to be lawn or existing tree masses.
- Trees provided in this zone may be grouped together and placed anywhere within the zone per each residential block.

#### 7.3.5 RECREATION AREAS (INCLUDING TOT LOTS AND PLAYGROUNDS)

- Provide trees, shrubs/perennial beds, and ground covers as required to achieve a comfortable and safe environment for the intended activity.
- All other landscape areas to be lawn or existing tree masses.
- Plantings should convey the character of the overall development.
- Plants in this area may count toward common zone plants.

#### 7.3.6 XERISCAPE

- It is acceptable to utilize "Xeriscape" principles of landscape design to encourage the use of native, low water using drought tolerant plant materials. Reducing maintenance and water requirements on portions of the front, side, and back lawn areas.
- It is highly desirable to utilize perennials and shrubs immediately adjacent hardscape features and near the residence.
- Lawn areas must be maintained in one piece or continuous, not broken into several small patches

## 7.4 LANDSCAPE MATERIALS

Use local nursery or plantation grown stock plant material that is well shaped, well grown, vigorous, healthy and exhibits strong root systems. Plants shall be free from disease, stress, harmful insects and insect eggs, sun-scald, disfigurement, and abrasions. Provide plants that are typical of the species or variety, and conform to standards and measurements as set forth in ANSI Z60.1. All necessary plant pruning and care shall comply with ANSI A300. No decorative rocks, boulders, bark, or borders (except steel edging) shall be used in landscape plans. Specify appropriate maintenance practices for the plant material provided. The following principles shall also be considered during the design of the project:

## **7.4.1 TREES**

- Large, Medium and Small Type Trees. Refer to acceptable list as provided for in the Whiteman AFB Landscape Development Plan.
- **Ornamental trees** are small to medium trees with a special distinguishing characteristics including color and/or texture of foliage, fall color, flowers, fragrance, fruit or bark.
- Evergreen trees are trees that maintain their foliage year round and range from 10' to 50' at mature height. Refer to acceptable list as provided for in the Whiteman AFB Landscape Development Plan.

#### **7.4.2 SHRUBS**

Deciduous and evergreen shrubs are plants that can naturally maintain heights from 1'to 15' tall and provide definition of space or screening for walks, patios, courtyards, porches, foundations, and utilities. Refer to acceptable list as provided for in the Whiteman AFB Landscape Development Plan.

## 7.4.3 GROUND COVER

Ground cover appropriate for the area may be planted in lieu of turf to add visual contrast and reduced maintenance and irrigation requirements. Ground cover shall be of a size and spacing to provide a minimum of 50% coverage after the first full growing season and complete coverage at maturity. Edging shall be provided for all ground cover areas where they abut turf areas.

#### **7.4.4 MULCH**

Mulch all plant materials installed under this project with a minimum of 3" deep material measured after settlement has occurred. Organic hardwood and inorganic decorative gravel mulches are acceptable. Include permeable commercial-grade landscape fabric as a weed barrier. Mulch around all shrubs, and groundcovers. Trees shall have a 1.2 meter (4') diameter minimum circle of mulch. All mulch areas shall be bordered by steel edging where it abuts turf areas.

# **7.4.5 EDGING**

All landscape edging is to be steel or aluminum edging 3/16" x 4" minimum. Choose one type and finish color for the entire project.

# **7.4.6 SOIL TEST**

The successful contractor shall perform soil test for pH, chemical analysis, and mechanical analysis to establish the quantities and type of soil amendments and/or fertilizers required to meet local growing conditions for the type and variety of plant material specified. Describe methods of amending topsoil, if required by soils test, or state acceptable conditions for intended uses. Describe the method of topsoil stripped and storing that will be utilized until the time of final placement.

#### 7.4.7 TOP-SOIL

Topsoil shall conforming to ASTM D 5268 with a pH of 5.5 to 7.0 with an organic matter content between 10-20% by volume, or 4-7% by weight. Topsoil shall be free from stones 3/4" or larger, and other extraneous materials harmful to plant growth.

## 7.4.8 PERCOLATION TEST

The successful contractor shall perform test for percolation to determine positive drainage of plant pits and beds. All soil and drainage conditions detrimental to the growth of plant material shall be identified and a offer correcting the conditions shall be submitted for approval.

#### 7.4.9 PLANT INSTALLATION

All proposed plant locations shall be staked/flagged and approved by the Contracting Officer prior to planting. The plant material shall be installed during appropriate seasonal planting times or when beneficial results can be obtained. Contractor shall verify the location of all underground utilities. When obstructions below ground or poor drainage affect the planting operation, the contractor shall submit for approval the proposed adjustments to the plant location, type of plant, planting method or drainage correction.

#### 7.4.10 LANDSCAPE MAINTENANCE

Maintenance operations shall begin immediately after each plant is installed and shall continue until the plant establishment period commences. Upon completion of the last day of planting operation and acceptance of the plant material has been conveyed in writing, the plant establishment period for maintaining installed plants shall commence and shall be in effect for the remaining contract time period not to exceed 12 months. When the planting operation extends over more than one season or there is a variance to the planting times, separate plant establishment periods may be allowed for the work completed.

## 7.4.11 LANDSCAPE ESTABLISHMENT PERIOD

Installed plants shall be maintained in a healthy growing condition. The maintenance of plants shall include, but is not limited to; periodic straightening, tightening/replacing stakes and guying material, repairing tree wrap, protecting from erosion, maintaining erosion material, supplementing mulch, pruning, maintaining edging, maintaining plant labels, watering, weeding, fertilizing, removing and replacing unhealthy or dead plants.

# 7.4.12 UNHEALTHY PLANTS

A plant shall be considered unhealthy or dead when the main leader has died back or 25 percent of the crown /canopy is dead (or has been removed) when compared to adjacent similar material. Determine the cause for an unhealthy plant. Unhealthy or dead plants shall be removed immediately and shall be replaced as soon as seasonal conditions permit in accordance with the following warranty paragraph.

#### 7.4.13 LANDSCAPE WARRANTY

Furnished plant material shall be guaranteed to be in a vigorous growing condition for a period of 12 months regardless of the contract time period. A plant shall be replaced one time under this guarantee as long as proper maintenance has been provided. Plants replaced due to neglect or harmful growing conditions shall be warranted for one full year from time of replacement. Transplanting existing plants, for the convenience of the Government, requires no guarantee.

## 7.5 SEEDING AND SODDING

#### 7.5.1 SOIL PREPARATION

Prior to seeding or sodding, topsoil shall be loosened to a minimum depth of 6 inches and broken up to a fine smooth surface, amended if necessary per the soil test, with workable texture suitable for seeding and/or sodding.

# **7.5.2 SEEDING**

Minimum requirement is to seed all disturbed areas. All seeded areas shall be seeded by hydroseeding. Mix seed, fertilizer, and fiber mulch, using equipment designed for hydro-seeding application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application. Mix slurry with asphalt-emulsion tackifier. Apply slurry in two-step process. Apply first coat at a minimum rate of 500lb/acre dry weight, but not less than the rate required to obtain seed sowing rate. Apply slurry cover

coat of fiber mulch at a rate of 1000lb/acre. State approved seed of the latest season's crop shall be provided in the original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with applicable State seed laws. Grass seed shall be fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances. Seed shall be mixed by the dealer and shall be delivered to the site and prepared for hydroseed mixing. Seed that has become wet, moldy or otherwise damaged in transit or storage will not be accepted. Weed seed shall not exceed ½ percent by weight of the total mixture. Seed mixtures shall be proportioned by weight as follows:

- 90 percent turf type tall fescue (minimum of three varieties in the top 20% of the national Turfgrass Associations NTEP field trials)
- 10 percent improved Kentucky bluegrass (poa pratensis)

Seed mix to be approved prior to installation. Apply seed at a rate of 10lbs./1000sq.ft.

#### **7.5.3 SODDING**

Sod front and side yards and any portion of turf located within the back yard fencing. Turfgrass sod shall be number 1 quality/premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding". Furnish viable sod of uniform density, color and texture, strongly rooted, and capable of vigorous growth, and development when planted. Sod to be produced by a professional sod producer and grown on similar soils and climate to the site location. Sod to be comprised of the following grass species with not less than 85 percent germination, not less than 98 percent pure seed, and not more than ½ percent weed seed.

- 90 percent turf type tall fescue (minimum of three varieties in the top 20% of the national Turfgrass Associations NTEP field trials)
- 10 percent improved Kentucky bluegrass (poa pratensis)

Seed mix to be approved prior to installation. Apply seed at a rate of 10lbs./1000sq.ft.

The following principles shall also be considered during the design and construction of the project:

- Dry, moldy, yellow, irregularly shaped, torn or uneven end sod pieces will not be accepted.
- Sod shall be machine cut to a uniform thickness of 1 inch within a tolerance of 1/4 inch, excluding top growth and thatch.
- Sod anchors shall be used for slopes greater than 6:1 or as need to hold sod in place until established.
- Sod shall be placed within 16 hours of harvesting.
- Place a 5' wide swath of sod around all drain inlets, within drainage swales exceeding 3:1 and other areas where erosion can take place in non-sodded areas.
- Specify appropriate maintenance practices for the plant material provided.

#### 7.5.4 TURF INSTALLATION

The turf shall be installed during appropriate planting times and conditions recommended by the trade for the type and variety of turf specified. The turf operations shall be performed only during periods when beneficial results can be obtained and should be scheduled to coordinate with the acceptance of the housing units. Special care shall be taken by the contractor to ensure that an acceptable stand of turf has been established prior to turning unit over for occupancy. Failure to comply will require an extended maintenance period after occupancy.

#### 7.5.5 TURF PROTECTION

Immediately after turfing, the area shall be protected against traffic or other use by erecting barricades and providing signage as required.

#### 7.5.6 TURF MAINTENANCE

The maintenance of the turf areas shall include eradicating weeds, eradicating insects and diseases, protecting from erosion, maintaining erosion control materials, protecting turf areas from traffic, mowing, watering, post-fertilization, and replacing unsatisfactory turf areas prior to acceptance/occupancy.

## 7.5.7 TURF ESTABLISHMENT PERIOD

The turf establishment period for establishing a healthy stand of turf shall begin on the first day of work under the turf contract and shall end once accepted/occupied and not longer than three months or six mowings after the last day of turf operation. An unsatisfactory stand of turf shall be repaired as soon as turf conditions permit.

#### 7.5.8 SATISFACTORY STAND OF TURF

## 7.5.8.1 Seeded Yard Area

A satisfactory stand of turf from the seeding operation for a yard area is defined as healthy, well-rooted, even colored, viable lawn has been established free of weeds, bare areas, and surface irregularities with a minimum of 160 grass plants per square meter. Bare spots shall be no larger than 150-mm (6 inches) diameter. The total bare spots shall not exceed two (2) percent of the total seeded area.

#### 7.5.8.2 Seeded Field Area

A satisfactory stand of turf from the seeding operation for a field area is defined as healthy, well-rooted, even colored, viable lawn has been established free of weeds, bare areas, and surface irregularities with a minimum of 100 grass plants per square meter. Bare spots shall be no larger than 150-mm (6 inches) diameter. The total bare spots shall not exceed two (2) percent of the total seeded area.

#### **7.5.8.3** Sod Areas

A satisfactory stand of turf from the sodding operation is defined as, a healthy, well-rooted, even colored, viable lawn has been established free of weeds, open joints, bare areas, and surface irregularities.

# **Landscape Plan Checklist – Part 7**

Prepare plan(s) drawn to scale of $1$ "= $50$ " or larger and including north arrow and graphic scale for the FY03 and FY04 Task Order project sites.
Prepare plan(s) drawn to scale of 1''= 20' or larger and including graphic scale for a typical residential lot.
Name of the project, Offeror and the date of the plan.
Show property boundaries.
Location of all easements on the property.
Contour lines showing final proposed grades with an interval of not more than two feet (2') or adequate to identify and properly specify planting for areas needing slope protection.
Show all pavement surfaces, including driveways, walkways, trails, residential and through streets.
Show building locations including patios, porches, exterior walls, and doors locations.
Show all screen walls, retaining walls and fences.
Show direction and location of all proposed street and pedestrian lighting facilities.
Show the proposed location of all exterior signs, including monument signs.
Show location size and type of all over-head, at grade, and underground utilities and structures with proper notation, where appropriate, as to any safety hazards to avoid during landscape installation.
Indicate the type, location, size and quantity of all proposed landscape materials on the landscape plant. Proposed plant material shall be shown at mature or maintained size. Plants shall be labeled by plant type (large tree, small tree, medium shrub etc.) and installation size or buy symbol with appropriate plant key/legend.
Plans shall identify the location, type or depth of any accessory planting materials such as mulch, edging etc.
Identify existing vegetation to be saved.

# PART 8 – SITE UTILITIES

# **INDEX**

8	SITE UT	TILITIES	. 3
	8.1 GEN	IERAL	. 3
	8.1.1	Site Utilities Description	
	8.1.2	Site Utilities Goals	
	8.1.3	Utilities Metering System	
	8.1.4	Utility Appurtenant Locations	
		AVATION, TRENCHING AND BACKFILLING FOR UTILITIES	. 7
	8.2.1	General	
	8.2.2	Trenches	
	8.2.3	Water Mains Near Sewers	
	8.2.3.1		
	8.2.3.2	General Horizontal Separation.	
	8.2.3.3	Vertical Separation	
	8.2.3.4	Unusual Conditions.	
	8.2.3.5	Force Mains	
	8.2.3.6	Sewer Manholes	5
	8.3 MAI	RKING OF UNDERGROUND UTILITIES	. 5
		TER DISTRIBUTION AND WATER SERVICE LINES SYSTEM	
	8.4.1	General	
	8.4.2	Existing Water Service	
	8.4.3	Water Distribution and Service Design Criteria.	
	8.4.3.1	Protection of Water Supplies	
	8.4.3.2	Flow Requirements	
	8.4.3.3	Water Line Requirements	
	8.4.3.4	Fire Hydrants	7
	8.4.3.5	Cutting Pipe	7
	8.4.3.6	Hydrostatic Leakage Tests	
		6.1 Pressure Tests	
		6.2 Leakage Tests	
		6.3 Concurrent Hydrostatic Tests	8
	8.4.3.7	Disinfection	
		NITARY SEWAGE SYSTEM	
	8.5.1	General	
	8.5.1.1	T I	
	8.5.2	Design Criteria	
	8.5.3	Minimum Velocity	
	8.5.4	Domestic Sewage Requirement	
	8.5.5	Sewer Mains	
	8.5.6	Sewer Laterals	
	8.5.7	Manholes	
	8.5.8	Calculations and Drawings	
	8.5.9	Coordination	
	8.5.10	Leakage Tests	
	8.5.11	Test for Deflection	
		RM DRAINAGE SYSTEM	
	8.7 NA	ΓURAL GAS DISTRIBUTION SYSTEM	
	8.7.1	General	
	8.7.2	Existing System	11
	8.7.3	Materials	
	8.7.3.1	Polyethylene Pipe	11
	8.7.4	Testing	11
	875	Dring	12

8.7.6 Valves, Regulators and Meters	
8.8 ELECTRICAL DISTRIBUTION	
8.8.1 General	12
8.8.2 Existing System	
8.8.3 System Design Criteria	
8.8.4 Primary Distribution Requirements	
8.8.4.1 General	
8.8.4.2 Guidance for Transformer Sizing	
8.8.5 Service Lateral and Service Entrance Requirements	
8.8.5.1 Service Laterals	14
8.8.5.2 Service Entrance	
8.8.6 Street and Area Lighting	
8.9 TELEPHONE	14
8.10 TELEVISION	15
8.11 REQUIRED SITE ELECTRICAL DESIGN ANALYSIS	16
8.11.1 General	
8.11.2 Load Calculations	
8.12 CATHODIC PROTECTION	16
8.13 OFFER CHECKLIST FOR SITE UTILITIES	

## **8 SITE UTILITIES**

#### 8.1 GENERAL

#### 8.1.1 SITE UTILITIES DESCRIPTION

Site utilities shall include water, both domestic and fire protection, natural gas, electrical and communication, both telephone and cable TV as well as sanitary and storm sewers. All of these existing site utilities are present in the existing neighborhoods immediately adjoining the Development Area. Furthermore, adequate utility capacities for water, natural gas, electrical power and communications are available in these adjoining neighborhoods to support the new Family Housing in the Development Area for all phases planned. However, in order to adequately support the new sanitary sewer system in the Development Area, work will most likely be required to extend beyond the immediate adjoining neighborhoods as well as the limits of the Development Area as shown on Drawing 8.2. For a description of Storm sewer requirements refer to Part 6, Grading, Drainage and Erosion Control. Upgrading of the existing utilities outside of the limits of construction are not a part of this project. The Contractor shall refer to the individual utility drawings included in this RFP showing existing utility mains / possible points of connection. All existing utility information provided shall be verified by the Contractor.

#### 8.1.2 SITE UTILITIES GOALS

The Contractor shall consider the connections to and extensions of the existing utilities as an important part of this project. Connections and extensions of all utilities from the point(s) of connection to the Development Area shall be included and shown in the proposal. All utility lines i.e. water, natural gas, electrical power and communications, sanitary sewer and storm water at the Development Area shall be new. Where noted herein, new utility distribution lines shall be designed and installed to form a "looped" system throughout the Development Area. Water, natural gas, sanitary sewer, power and communication services shall be installed in utility easements as described herein and conforming to Figure 8.1.2. Refer to Part 4 for additional site criteria information. All such lines shall be installed underground except as follows. Place any necessary aboveground items such as electric transformers, electric switches, junction boxes, cable TV and telephone pedestals, etc. within the easement where the utility is located but in no case less than thirty (30) feet from any street. Consideration should be given to visual impact and safety / maintainability issues when placing such devices.

The design and installation of all new utility distribution lines in the Development Area shall fully support the FY03 development as well as anticipate any necessary "extensions" for FY04 Option 1 to Task Order and future Task Order Areas beyond. Disruption of services and/or "tearing-up" of streets, walks, jogging trails, etc. will not be permitted in future Task Order Areas to "extend" main distribution lines. All new utility services noted herein throughout the Development Area shall be sized for full "build-out" of the Development Area as shown on the Conceptual Land Use Map in Part 4.

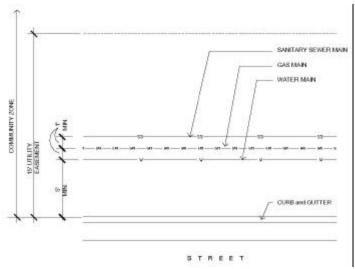


Figure 8.1.2 – Utility Easement Schematic

#### 8.1.3 UTILITIES METERING SYSTEM

Individual utility metering at each family housing unit will not be required as part of this project. However, refer to each utility herein for specific metering requirements.

#### 8.1.4 UTILITY APPURTENANT LOCATIONS

New underground utility lines, including appurtenant structures such as valve boxes, manholes, vaults, etc. shall not be located under road shoulders or drainage ditches to the greatest extent possible. Utilities laid along a street shall be located a minimum of five (5) feet from the curb. Refer to Part 4 for additional site utility criteria information. Service entrances for each housing unit shall be as noted herein under each specific utility heading.

## 8.2 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES

#### **8.2.1 GENERAL**

The Contractor shall avoid running new utilities under streets, sidewalks, and paved areas where at all practicable. Placing of new utility lines underneath buildings, except service laterals where noted, is prohibited. In cases where it is necessary for the new utilities to cross existing streets and sidewalks (to make connection to and/or extension of existing utility lines), the Contractor shall install lines by trench-less methods. Open trench methods will not be allowed unless written permission is obtained and approved by Whiteman AFB. When open trench methods are approved, streets and sidewalks shall be saw cut and removed and replaced to match existing conditions. Trench walls shall be excavated to a stable angle of repose as required to properly complete the work. Trench excavations shall adhere to requirements prescribed in EM 385-1-1, latest edition, Safety and Health Requirements Manual. Special attention shall be given to slopes that may be adversely affected by weather or moisture content. Bedding and initial backfill material shall be in accordance with the manufacturer recommendations. Portions of walks and concrete pavements requiring removal shall be removed to the nearest contraction joint. All existing utilities (in existing neighborhoods), including but not limited to utilities listed above that are crossed during connection to and extension of, shall remain in service during construction. If this is not possible, all outages shall be coordinated with the Contracting Officer. All underground utilities identified from field data and surveys, site investigations, and digging permit locates, shall be marked within and adjacent to areas of the work. All work areas shall be investigated with detection devices for cables and pipelines, to confirm locations, identify unknown utilities, and establish depths prior to beginning any digging. All underground utilities potentially disturbed by the work shall be found by hand digging prior to mechanical trenching or excavating in the vicinity. The Contracting Officer shall be notified of detection activities forty-eight (48) hours in advance. Detection devices shall be on-site at all times.

#### 8.2.2 TRENCHES

The trench for water lines, sewers (sanitary and storm), gas or electrical lines shall be in accordance with Division 2 Technical Specifications in this RFP, Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES. Water, sanitary sewer, storm sewers and gas mains shall be placed in separate trenches. The separate trenches shall maintain a minimum horizontal separation of twelve (12) inches.

## 8.2.3 WATER MAINS NEAR SANITARY SEWERS

#### 8.2.3.1 General

There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenance thereto which would permit the passage of any sewage or polluted water into the potable supply. No water pipe shall pass through or come in contact with any part of a sewer manhole. While no general statement can be made to cover all conditions, it is generally recognized that sewers shall meet the requirements of Missouri Code of State Regulations 10 CSR 20-8.120 with respect to minimum distances from public water supply wells or other water supply sources and structures.

#### 8.2.3.2 Horizontal Separation

Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed drain or sewer line. The distance shall be measured edge to edge. Should local conditions prevent a lateral separation of ten (10) feet, a water main may be laid closer than ten (10) feet to a storm or sanitary sewer line, provided that the water

main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer line and, in either case, at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer line. When it is impossible to obtain vertical or horizontal separation, the sewer line shall be re-laid and constructed with ductile iron pipe with mechanical or compression joints, and shall be pressure-tested to assure water-tightness before backfilling.

#### 8.2.3.3 Vertical Separation

Where water mains must cross over or under storm sewers, storm drains or sanitary sewers, the water main shall be laid to provide a vertical separation of at least eighteen (18) inches between the outsides of the water and sewer lines. A full length of water main pipe shall be located so that the joints will be equally distant from the sewer and as remote therefrom as possible. This vertical separation shall be maintained for that portion of the water main located within ten (10) feet horizontally of any sewer line that it crosses, said ten (10) feet to be measured as the normal distance from the water main to the sewer. Adequate structural support shall be provided for the sewer to prevent damage to the water main.

#### 8.2.3.4 Unusual Conditions

Where conditions prevent the minimum vertical separation as set forth above from being maintained, the water main shall be laid with ductile iron pipe which must extend on each side of the crossing until the normal distance from the water main to the sewer is at least ten (10) feet. In making such crossings, a full length of pipe shall be centered over or under the sewer to be crossed so that the joints will be equally distant from the sewer and as remote therefrom as possible. The sewer line shall also be constructed of ductile iron pipe with mechanical or compression joints until the normal distance from the sewer to the water main is at least ten (10) feet. Where these conditions cannot be met, the Department of Natural Resources shall be consulted as to the precautions to be taken to protect the public water supply.

#### 8.2.3.5 Force Mains

If force mains are determined to be required, there shall be at least a ten (10) foot horizontal and eighteen (18) inch vertical separation between water lines and sanitary sewer force mains. No exceptions will be allowed.

## 8.2.3.6 Sewer Manholes

No water pipe shall be located closer than ten (10) feet to any part of a sewer manhole.

#### 8.3 MARKING OF UNDERGROUND UTILITIES

Except at natural gas lines, all new underground utilities shall be marked with plastic colored, printed marking tape plus an insulated copper wire. At all natural gas lines, plastic colored, printed marking tape and transponder pegs shall be installed.

Insulated copper wire size to be #12 AWG (minimum). Warning tape and copper wire shall be installed directly above all pipe, at a depth of approximately twelve (12) inches above the utility being marked. Copper wire leads shall be brought up, identified and protected in valve boxes, on service risers or any other convenient location. The Contractor shall bare approximately two (2) feet of wire at each terminal end for the transmitter connection and increased conductivity. Plastic colored, printed marking tape shall be in accordance with Division 2 Technical Specifications in this RFP, Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES. Tape color shall be as specified below and shall bear a continuous printed inscription describing the specific utility.

## COLOR MARKINGS FOR UTILITIES

Red	Electric
Yellow	Gas
Orange	Telephone, Cable TV
Blue	Water Systems
Green	Sewer Systems

Transponder pegs shall be installed at not less than fifty (50) feet along all natural gas line piping and at all valves, service taps, tees, crossings and changes in direction. Transponder pegs shall be #C9784, 83.0kHz, yellow as manufactured by Communications Technology Corp. of America or approved equal. Transponder pegs shall be installed per the manufacturer's printed instructions and as noted herein.

#### 8.4 WATER DISTRIBUTION AND WATER SERVICE LINES SYSTEM

### 8.4.1 GENERAL

The Contractor shall design and install a complete, usable, new water distribution system for the new family housing in the Development Area. New water distribution lines shall connect to the existing lines in the adjacent neighborhoods and provide a "looped" system design. All new water service distribution lines in the Development Area shall be located in the utility easement in the Community Zone areas with service lines routed to each unit from that area. Refer to Figure 8.1.2 and Part 4, Site, for additional site criteria information. Refer to Part 11, Unit Design – Plumbing for additional water information relative to the individual housing unit.

#### 8.4.2 EXISTING WATER SERVICE

Asbestos cement (AC) and polyethylene vinyl chloride (PVC) water mains exist at the approximate locations as shown on Drawing 8.1 as included with this RFP. The Contractor shall verify all information shown. The existing water distribution system shall be used to the maximum extent practical for purposes of providing water service to the Development Area. The existing mains shall remain in service during construction of this project except for pre-notified, limited short periods which the Contractor shall coordinate with Whiteman AFB. If the contractor determines it is a necessary to install new water mains at existing locations, they shall be designed as stated in Paragraph 8.4.3. Where connections are made between the new work and the existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer. If any existing water main line or fire hydrant is damaged during construction, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the Government.

## 8.4.3 WATER DISTRIBUTION AND SERVICE DESIGN CRITERIA

New water distribution lines, service lines, valves, joints, fittings, etc. shall be designed and constructed in accordance with Missouri Department of Natural Resources (MDNR) Public Drinking Water Program "Design Guide for Community Public Water Supplies" and UFGS Section 02510 WATER DISTRIBUTION SYSTEM. All connections made by the Contractor to the existing water distribution system (water mains) shall be in accordance with all applicable local, state, and federal standards and as stated herein. The water mains shall be considered as that part of the water system supplying fire hydrants. Mains shall be valved so that no more than two (2) fire hydrants will be out of service due to a single break in the water distribution system. Pipes supplying groups of dwelling units or one housing unit exclusively shall be referred to as service lines. Isolation valves shall be easily accessible and shall be installed as a minimum at the intersection of all mains. No main extension shall be less than eight (8) inches in diameter. Dead end water lines up to three hundred (300) feet long shall be permitted if terminated by fire hydrants or flushing hydrants. The Contractor shall be responsible for assisting the Contracting Officer in obtaining a construction permit from the Missouri Department of Natural Resources (MDNR), Public Drinking Water Program, before installing any waterlines. The Contractor's responsibility shall include obtaining the required forms or applications, assisting in completing the same and paying of any applicable fees. A copy of the completed, final permit shall be provided to the Contracting Officer for review prior to any work beginning. The Offeror shall include any and all costs associated with obtaining such permit(s) with Offer. The Contractor shall include a line item for permit submittals as part of the overall project schedule referenced in Section 01320 Project Schedule.

## 8.4.3.1 Protection of Water Supplies

Refer to Section 8.2 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES herein, paragraph 8.2.3 Water Mains near Sanitary Sewers for specific requirements.

#### 8.4.3.2 Flow Requirements

The water service system shall be sized to accommodate for the domestic demand required for the new Family Housing Units served in the entire Development Area. The water domestic demand shall be at a rate of three-hundred fifty (350) gal/day for three (3) bedroom units. A maximum velocity of ten (10) feet per sec shall be used for all water lines. Fire demand shall be one thousand two hundred fifty (1,250) gpm for two (2) hours. Minimum pressure at any point in the system shall not be less than twenty (20) psi.

#### **8.4.3.3** Water Line Requirements and Metering

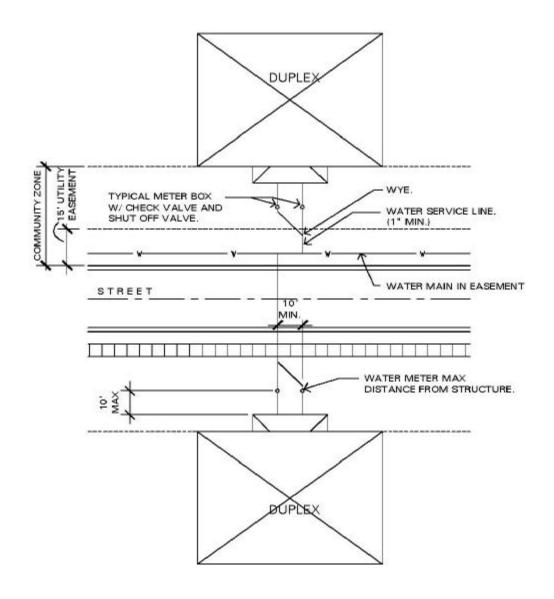
The piping pressure class is one-hundred fifty (150) psi for water system. Pipe shall be PVC meeting AWWA C900 or ductile iron. Ductile iron pipe shall be polyethylene wrapped in accordance with AWWA C600. The sizing of the waterline pipe diameter shall be determined by using Hazen-Williams "C" value of 140 for plastic pipe and 120 for other pipe material. Service lines larger than two (2) inches shall be connected to the main by a tapped saddle, tapping sleeve and valve, service clamp or reducing tee, depending on the main diameter and the service line diameter, and shall have a gate valve. The service lines shall include the pipeline connecting the building piping to the new water distribution lines. The service connections shall be via a new directly-tapped corporation stop, or by a service clamp for water services lines two (2) inches or smaller diameter. A combination stop and a copper gooseneck shall be provided with either type of connection. The service lines to each family housing unit shall be not less than one (1) inch size. Water line trenches shall be of a depth to provide a minimum cover of forty-two (42) inches from the existing ground surface, or from the finished grade, whichever is lower, to the top of the pipe. Provide each housing unit with a separate service stop and check valve exterior to the structure as shown on Figure 8.4.3.3. A water meter box shall be installed for all service stops and check valves and shall extend to finish grade. The piping and valves in the water meter box shall be installed to permit the future installation of a water meter.

## 8.4.3.4 Fire Hydrants

All fire hydrants in the Development Area shall be new. Existing fire hydrants in adjoining neighborhoods shall remain in place, unless damaged during construction. Fire hydrants shall be compatible with those presently in use at the installation, with similar pump and hose connections. All fire hydrants shall be UL listed, dry barrel resilient seat type (traffic model), and conforming to AWWA C502 with valve opening at least five (5) inches in diameter. The fire hydrants shall be designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than eight (8) inches above the ground grade. Hydrants shall have a six (6) inch bell connection with two (2) two and one-half (2-1/2) inch hose connections and one (1) four and one-half (4-1/2) inch pumper connection. Outlets shall have American National Standard fire-house coupling threads. All working parts shall be bronze. Design, material, and workmanship shall be equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with one (1) coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and two (2) finish coats of silicone alkyd paint conforming to SSPC Paint 21 of the installation's standard color or as directed by the Contracting Officer. Fire hydrant spacing shall be no greater than four hundred (400) feet apart, with no dwelling unit more than three hundred (300) feet from at least one (1) hydrant. Preference is to install hydrants at intersections whenever possible. Hydrant laterals shall be six (6) inches minimum size, shall not exceed fifty (50) feet in length, and shall have an underground shut off valve with an adjustable valve box in each lateral within ten (10) feet of the hydrant for isolating hydrant. Hydrants shall have their pumper outlet facing the street. Hydrants shall be located a minimum of three (3) feet and a maximum of seven (7) feet from payement, and shall not be located in sidewalks or where obstructed by parked vehicles, shrubbery, etc..

## 8.4.3.5 Cutting Pipe

Cutting pipe shall be done in a neat and workmanlike manner without damage to the pipe and in accordance with UFGS Section 02510 WATER DISTRIBUTION SYSTEM. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.



SCHEMATIC OF WATER LINE REQUIREMENTS

Figure 8.4.3.3

## 8.4.3.6 Hydrostatic Leakage Tests

Hydrostatic pressure and leakage tests shall be conducted on the new water lines in accordance with UFGS Section 02510 WATER DISTRIBUTION SYSTEM and AWWA C600. Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, tests shall not be made until at least five (5) days after the installation of the concrete thrust blocking, unless otherwise approved.

#### 8.4.3.6.1 Pressure Tests

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping shall be subjected for one (1) hour to a hydrostatic pressure test of one-hundred fifty (150) psi maximum. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants and valves shall be carefully examined during the partially open trench test. Pressure test shall be in accordance with UFGS Section 02510 WATER DISTRIBUTION SYSTEM and AWWA C600.

## 8.4.3.6.2 Leakage Tests

Leakage test shall be conducted after the pressure test has been satisfactory. The duration of each leakage test shall be at least two (2) hours, and during the test the water line shall be subjected to not less than one-hundred fifty (150) psi pressure at low point in system. Leakage test shall be in accordance with UFGS Section 02510 WATER DISTRIBUTION SYSTEM.

## 8.4.3.6.3 Concurrent Hydrostatic Tests

The Contractor may elect to conduct hydrostatic test using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be satisfactory as specified. All replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

- 1) Pressure test and leakage test may be conducted concurrently.
- 2) Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic test. This may only be accomplished after the system has been thoroughly flushed with water until all entrained dirt and mud has been removed. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be re-accomplished. Testing, correction and retesting shall be accomplished at no additional cost to the Government.

## 8.4.3.7 Disinfection

Before acceptance of potable water system, the Contractor shall disinfect all new water lines and any other lines that did not remain fully pressurized during construction or connection. The water line piping shall be disinfected in accordance with the American Association Standard AWWA C651 and in accordance with UFGS Section 02510 WATER DISTRIBUTION SYSTEM. Testing shall not be considered complete until two consecutive days of bacteriological samples show no contamination. Test results shall be submitted to and approved by the MDNR. Proof of MDNR approval shall be provided to the Contracting Officer for review prior to acceptance of potable water system.

## 8.5 SANITARY SEWAGE SYSTEM

## 8.5.1 GENERAL

The Contractor shall design and install a complete, usable, new sanitary sewer system for new family housing in the Development Area. When fully developed, the anticipated volumes from the Development Area will most likely require that the discharge from this area be placed into a gravity sewer line that is no smaller than twelve (12) inches. Based upon available information on the existing sanitary sewer lines in the adjoining neighborhoods, it is anticipated that the new sanitary sewer system will require the use of a pump station(s) and force main(s) as part of its final discharge. As part of the Calculation and Drawings required herein, the Contractor will also be required to verify existing pipe and system capacities once the final point of discharge is

determined. All new sanitary sewer lines in the Development Area shall be located in the utility easement in the Community Zone areas with lateral lines routed to each unit from that area. Refer to Figures 8.1.2 and 8.5.6 and to Part 4 for additional site criteria information. The existing manholes in the existing housing areas shall remain in place and be reused. Existing sanitary sewer lines and manholes are shown on Drawing 8.2 as included in this RFP. Refer to Part 11, Unit Design – Plumbing for additional sanitary sewer information relative to the individual housing unit.

#### 8.5.1.1 PROTECTION OF WATER SUPPLIES

Refer to Section 8.2 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES herein, paragraph 8.2.3 Water Mains near Sanitary Sewers for specific requirements.

#### 8.5.2 DESIGN CRITERIA

The new sanitary sewage system shall be designed and constructed in accordance with Missouri Department of Natural Resources (MDNR) Guidelines, local codes and regulations, and with UFGS Section 02531 SANITARY SEWERS. The Contractor shall field verify the sanitary sewer capacity and invert elevations to ensure that it is adequate for the flows generated by the new family housing units. The minimum earth cover over sewer lines is forty-two (42) inches. Fittings, and joints shall be compatible with the pipe supplied and have a strength not less that that of the pipe. The Excavation, Trenching and Backfilling for Sanitary Sewer lines shall be as described herein under Paragraph 8.2 EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES herein. The Contractor shall be responsible for assisting the Contracting Officer in obtaining all permits required including, but not limited to, "Application for Construction Permit – Sewer Extension", "Continuing Authority Approval Sewer Line Extension", "Missouri State Operating Permit". The Contractor's responsibility shall include obtaining all required forms or applications, assisting in completing the same and paying of any applicable fees. A copy of all completed, final permit(s) shall be provided to the Contracting Officer for review prior to any work beginning. The Offeror shall include any and all costs associated with obtaining permit(s) with Offer. The Contractor shall include a line item for permit submittals as part of the overall project schedule referenced in Section 01320 Project Schedule.

#### 8.5.3 MINIMUM VELOCITY

A minimum velocity shall be 2.5 feet per second when flowing at the maximum design flow depth. Design pipes with 80 percent full as critical flow depth. All design slopes shall be calculated using Manning's equation. The Contractor shall include all calculations for the sanitary sewer system in the design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN).

## 8.5.4 DOMESTIC SEWAGE REQUIREMENT

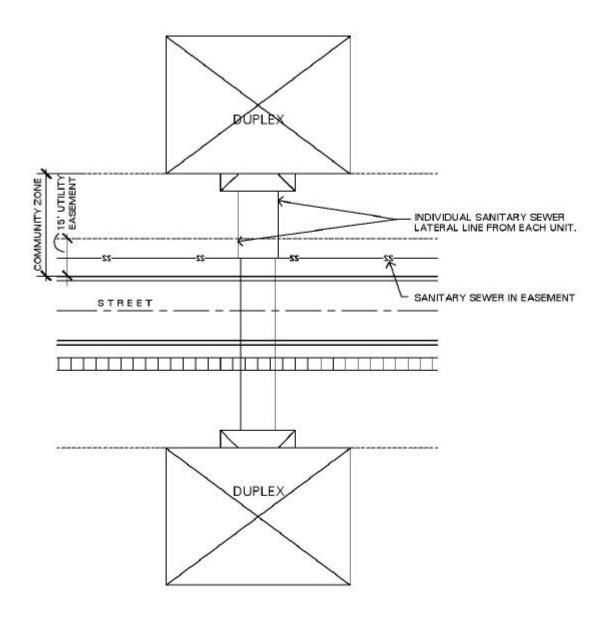
New sanitary sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day.

#### 8.5.5 SEWER MAINS

New sewer main pipe material shall be PVC (SDR 35 or 26), PE or DIP. Main pipe shall be sized to meet design criteria outlined herein; however, minimum size shall be eight (8) inches in diameter.

#### 8.5.6 SEWER LATERALS

New sewer lateral pipe material shall be same as main pipe material. New sewer laterals (connections from interior family housing sewer lines to the mains) shall be provided for each housing unit. Individual laterals shall be provided for each side of a duplex unit. Minimum size for each lateral is four (4) inches. Only interior house sewer lines may be placed under buildings. All house sewer lines within and under buildings shall be as specified in Section 01000, Part 11 UNIT DESIGN – PLUMBING. House laterals from any one unit (or duplex) shall not pass under any other unit(s). Clean-outs shall be provided to allow cleaning of all lines. Clean-outs, in yard areas, shall be set in a box with a hinged cover. Clean-outs shall be provided for all branches at points of change in direction before running out to a main. The building service sewer line (exterior to the unit) shall be provided with a combination test tee and clean out within five (5) feet of the building. Foundation and roof drains shall not be connected to the sanitary sewer. Refer to Figures 8.1.2 and 8.5.6 and to Part 4 for additional site criteria information.



SCHEMATIC OF SANITARY SEWER LATERAL REQUIREMENTS

Figure 8.5.6

#### 8.5.7 MANHOLES.

Existing manholes shall be used to the maximum extent practical for final discharge point from the Development Area. If the Contractor determines it is necessary to install a new manhole, it shall be designed as indicated herein. The pipe connection to existing manhole shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. The hole for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe and the new pipe shall be joined to the manhole with a gasketed, flexible watertight connection. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

New manholes are to be installed at changes of direction, slope, and size. Manholes shall be spaced not more than 400 feet apart. Manholes shall be located at intersections of streets when possible. New manholes shall be provided in lieu of cleanouts. Avoid placing manholes where the tops will be submerged or subject to surface water inflow. Where the invert of the inlet pipe would be more than 1.5 feet above the manhole floor, a drop connection shall be provided. Manholes shall be waterproofed on the exterior. Inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible, watertight connection or any watertight connection that allows differential settlement of the pipe and manhole to take place.

#### 8.5.8 CALCULATIONS AND DRAWINGS

The Contractor shall prepare final drawings, including details, of all sanitary sewage structures. The Contractor shall complete all the necessary topographic and utility surveys as required. Verification of actual rim and flow line elevations, particularly at the taps, shall be made by the Contractor prior to beginning final design. In addition to final drawings, elevation information, details etc. the successful Contractor shall also include a specification for approval covering the work that clearly defines his methods, materials and equipment as well as engineering calculations supporting his proposed selection of materials in the design submittals after contract award (see Section 01332 SUBMITTALS DURING DESIGN). Upon completion of the sanitary sewer installation(s), the Contractor shall certify that the collection sewers have been built in accordance with the approved plans by means of preparing "as-built" plans, prepared by a registered professional engineer. These plans, and any other necessary documentation, shall be submitted to the State of Missouri, DNR as required by the terms of the Sanitary Sewer Construction Permit issued at the beginning of the work.

#### 8.5.9 COORDINATION.

All work on existing manholes and new sewer lines to be coordinated by Contractor with the Contracting Officer prior to construction.

#### 8.5.10 LEAKAGE TESTS

Lines shall be tested for leakage by low-pressure air testing, infiltration tests or exfiltration tests, as appropriate. Low-pressure air testing for PVC pipe materials shall as prescribed in UBPPA UNI-B-6. The air test, if used, as a minimum shall conform to the test procedure described in ASTM C 828-76T. Low pressure air testing procedures for other pipe materials shall use pressures and testing times as described in ASTM C 828 and C 924, after consultation with the pipe manufacturer. Prior to infiltration or exfiltration tests the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. When the Contracting Officer determines that infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or the exfiltration test shall not exceed 0.2-gallon per inch diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made

and retesting accomplished. Testing, correction and retesting shall be accomplished at no additional cost to the Government. Leakage Test shall conform to UFGS Section 02531 SANITARY SEWERS.

#### 8.5.11 TEST FOR DEFLECTION

When PVC flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline not less than 30 days after completion of all work including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads. Deflection test shall conform to UFGS Section 02531 SANITARY SEWERS.

## 8.6 STORM DRAINAGE SYSTEM

Refer to SECTION 01000, PART 6 - GRADING, DRAINAGE AND EROSION CONTROL for this work.

## 8.7 NATURAL GAS DISTRIBUTION SYSTEM

#### 8.7.1 GENERAL

The Contractor shall design and provide a complete, usable, new natural gas distribution system for the new family housing in the Development Area. New natural gas distribution lines shall connect to the existing lines in the adjacent neighborhoods and provide a "looped" system design. The gas distribution system shall comply with the requirements of NFPA 54. Installation of gas piping will be in accordance with ANSI B31.8 and 49 CFR. All new gas service distribution lines in the Development Area shall be located in the utility easement in the Community Zone areas with service lines routed to each unit from that area. Refer to Figures 8.1.2 and 8.7.1 and to Part 4 for additional site criteria information. Refer to Part 11, Unit Design – Plumbing and Part 13, Unit Design – HVAC for additional natural gas information relative to the individual housing unit.

#### 8.7.2 EXISTING SYSTEM

The natural gas being supplied to Whiteman AFB is type 985 to 1018 BTU/CF. Existing gas service lines in the adjoining neighborhoods are polyethylene and shall remain and are as shown on Drawing 8.3 as included with this RFP. Existing natural gas system pressure is fifteen (15) psi. Existing lines are buried to an approximate depth of twenty-four (24) to thirty-six (36) inches. All existing information shall be verified by the Contractor including pressure values, which are approximate. When connecting to existing steel piping systems, provision shall be made to ensure that the integrity of the cathodic protection is not compromised.

#### 8.7.3 MATERIALS

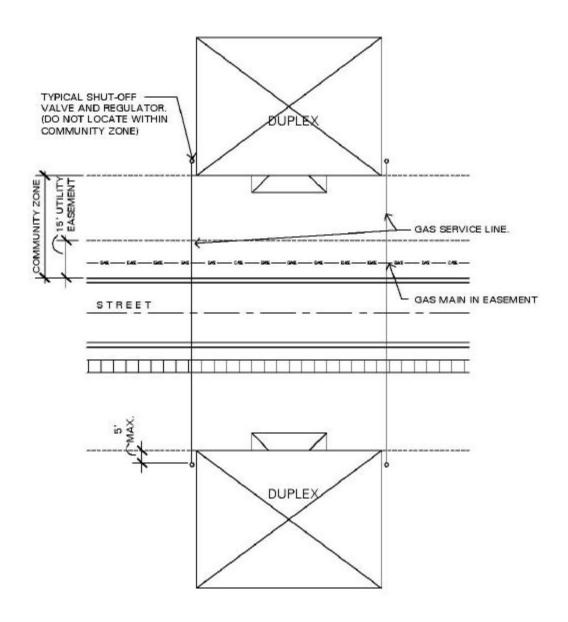
Materials and appurtenances shall be free of defects and suitable to accomplish the stated objectives of gas distribution systems. New exterior pipe that is buried below grade shall be polyethylene as described herein. New exterior pipe that is above grade shall be galvanized steel pipe in accordance with ASTM A53. Isolation valves are required at all connections to existing mains.

## 8.7.3.1 Polyethylene Pipe

Polyethylene pipe shall conform to ASTM D2513, Standard Specification for Thermoplastic Gas Pressure Piping Systems, with fittings complying with either ASTM D2513 or ASTM D2683, Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing. Connections to metal pipe shall comply with ANSI B16.5, Pipe Flanges and Flanged Fittings, or manufacturers recommended standards. Color of all polyethylene gas piping shall be yellow, minimum grade of PE2406.

#### **8.7.4 TESTING**

Since the new gas distribution mains will be required to connect to the existing gas mains, the Contractor shall design and install provisions in the new system to allow isolating it from all existing portions of the system to accommodate pressure testing. The pressure test shall be in accordance with ANSI B31.8. The test shall continue for at least twenty (24) hours between initial and final readings of pressure and temperature.



SCHEMATIC OF GAS SERVICE LINE REQUIREMENTS

Figure 8.7.1

#### **8.7.5 DRIPS**

Unless high pressure natural gas is used, drips shall be installed at the low points, immediately following reduction from high pressure to medium pressure (at supply points) and at occasional low points throughout the system to provide for blowing out the lines.

## 8.7.6 VALVES, REGULATORS AND METERS

Plug valves shall be installed at intersections of mains and other locations so that interruptions to service can be confined to no more than thirty (30) housing units. Each housing unit service entrance (two (2) entrances per duplex) shall be installed at a height sufficient to allow for installation of a shutoff valve and regulator. The service entrance piping to each housing unit shall be installed to permit the future installation of a gas meter.

## 8.8 ELECTRICAL DISTRIBUTION

#### 8.8.1 GENERAL

The Contractor shall design and provide a complete, usable, new electrical distribution system for the Development Area. New electrical distribution lines shall connect to the existing "point of future connection" at the adjacent neighborhood and provide a "looped" system design. Existing distribution lines, transformers, primary laterals and "point of future connection" shall remain and are as shown on Drawing 8.4 as included with this RFP. All new electrical service distribution lines in the Development Area shall be located in the utility easement in the Private Zone areas with service lines routed to each unit from a transformer or distribution pedestal. Refer to Part 4 for additional site criteria information. Refer to Part 14, Unit Design – Electrical for additional electrical information relative to the individual housing unit.

Electrical utilities, (electrical, telephone and cable TV) shall not be installed in the same trench as water, gas or sewer. Furthermore, no electrical lines of any type shall be installed in the same trench as communication lines (cable TV and telephone). Separation of such utilities shall be per the National Electrical Safety Code, and other applicable codes. The Contractor shall coordinate the installation of electrical, telephone, and cable TV cabling to minimize the time the trenches are open. The Contractor is responsible for the phasing of the installation of the new underground electrical, telephone, and cable TV services to the new family housing units. The Contractor shall coordinate with the Charter Communications TV Company and SBC to plan the phasing of the installation of the new underground services. The Contractor is responsible for coordinating with all utilities on details about demolition, installation, and construction cost responsibilities.

#### 8.8.2 EXISTING SYSTEM

- a) The primary in the housing area immediately to the East of the Development Area is part of the base distribution system. The system voltage is 12,470 volts, 3 phase, 4 wire. This was installed in approximately 1997. Switches, transformers and feeders were new at that time.
- b) The secondary voltage is 120/240 volt, single phase.
- c) The existing street lighting units are located at intersections and along curves and are fed from the nearest transformer. They were also installed in approximately 1997.
- d) The Contractor shall reuse the existing switch to the maximum extent possible and provide new pad mount transformers and switches with number and size per calculated loads.

## 8.8.3 SYSTEM DESIGN CRITERIA

All work on the electrical system shall meet requirements of the National Electrical Code Publication NFPA No. 70, the National Electrical Safety Code Publication ANSI C2, information provided herein and any other applicable standards. Equipment shall conform to the requirements of the National Electrical Manufacturers Association (NEMA) and Underwriters Laboratories, Inc (UL).

Refer to Section 8.11 REQUIRED SITE ELECTRICAL DESIGN ANALYSIS included herein for system calculations and submittals required by the Contractor as part of this Contract.

#### 8.8.4 PRIMARY DISTRIBUTION REQUIREMENTS

#### 8.8.4.1 General

Power distribution on the Base is 12,470 / 7200 volts, 3 phase, 4 wire. The distribution transformers serving the Development Area shall be connected to ensure balancing of the loads on all three phases of the feeder. The following criteria applies to the general exterior electrical distribution system within the Development Area:

- a) Primary distribution feeders shall be aluminum, 15 KV insulation, 95 KV, 133% BIL, XLP or EPR insulation and shall have 1/3 concentric neutral with an insulating jacket over the concentric neutral. Parallel conductors will not be used on primary feeders. All primary distribution conductors shall be buried a minimum of thirty-six (36) inches below finish grade.
- b) Primary lateral feeders shall be aluminum, 15 KV insulation, 95 KV, 133% BIL, XLP or EPR insulation with copper tape shielded neutral. All primary lateral conductors shall be buried a minimum of thirty-six (36) inches below finish grade
- c) Primary feeders, both distribution and lateral, shall be placed in four (4) inch Schedule 40 PVC conduit where such lines must pass under roadways or are located under other paved areas. Extend all conduit a minimum of six (6) feet beyond the edge of the roadway on both sides. All conduit lines shall be marked in accordance with the requirements specified in paragraph 8.3 "Marking of Underground Utilities". Provide all conduits with pull cord. Minimum burial depths to top of conduit shall be thirty-six (36) inches below finish grade.
- d) All high voltage (12.47 KV) taps / connections are to be made on above ground sectionalizers (terminals or junction boxes), or loop-fed pad-mounted transformers with appropriate bushings. Radial feeds to transformers are not acceptable. No high voltage taps shall be made in handholes or manholes. All distribution equipment shall be rated for the ampacity of the circuit / cable that is to be installed. All Primary and HV connections shall be loadbreak type.
- e) Neutral conductors, cable shields and all other noncurrent-carrying metallic parts of equipment shall be grounded. Ground resistance of not greater than 25 ohms shall be provided except at switches and transformers, where 10 ohms shall be the maximum unless soil conditions will not permit.
- f) Unless required for 3 phase loads, pad mounted transformers shall be 1 phase, 7200 volt primary, dead front, loop feed, oil immersed type, loadbreak group operated switch with surge arresters and dry-well mounted current limiting fuses. Transformers shall have two (2) 2-1/2% taps above and below rated voltage. Provide copper windings OA/FA Deg. C rise, 95KV BIL.. Unless otherwise required, the transformer secondary voltages shall be 120/240 volts, single phase, 3 wire. Loop feed transformers shall be provided with "Loop A-Loop B-Loop AB" primary switching and "load-on-off" secondary switching. All oil filled transformers shall have a certified oil sample on record with BCE before installation. All transformers and pad mounted switches shall be provided with an external and visible fault-indicating device. Rebuilt transformers are allowed.
- Paint all pad mounted equipment (including transformers, junction cabinets and switches) in accordance with Base standards. Provide fiberglass base with basement (twelve(12) inches deep, minimum). Base shall extend minimum of twelve (12) inches beyond the footprint of the installed equipment. Provide ground grid consisting of #1/0 CU conductor with a CU ground rod installed at each corner.
- h) The load for all new housing anticipated in the Development Area is estimated at approximately 295 amps @ 12,470V., 3 PH
- All cabinets (transformers, junction cabinets and/or switches) shall be vented and provided with padlock hasps.

#### 8.8.4.2 Guidance for Transformer Sizing

To arrive at demand load for each housing unit use demand loads for each living unit calculated in accordance with the National Electric Code, Article 220 except the air conditioning, whichever is larger, sized for 100 percent demand. In selecting a transformer, the name plate rating shall not be less than 90% of the kilovolt amperes total load calculated for the transformer using the table below. Not more than eight (8) living units shall be supplied from one transformer.

#### DEMAND FACTOR PERCENTAGE

Number of	% of Total of
Living Units	Demand Load for Units
2	80.0
3	60.0
4-8	50.0

#### 8.8.5 SERVICE LATERAL AND SERVICE ENTRANCE REQUIREMENTS

#### 8.8.5.1 Service Laterals

Each housing unit shall be provided with one underground secondary electrical service, originating from a transformer, to the meter centers (future) on the units. (Duplex units will require two (2) meter centers, etc.) The main circuit breaker, located adjacent to the future meter location, shall be sized to protect the service lateral. Service entrance conductors shall be direct burial type aluminum cable installed in two and one-half (2-1/2) inch Schedule 80 PVC conduit, buried a minimum of thirty (30) inches below grade.

#### 8.8.5.2 Service Entrance

Conduit risers shall be Schedule 80 PVC or rigid metal conduit. Fault current at the unit service entrance shall not exceed 10,000 amps. At the service entrance to each building provide a split to each unit using a NEMA 3R junction box. Provide a main circuit breaker (200 amp rating) for each housing unit on the exterior of the structures. Conduit risers from service lateral to exterior meters / service breakers shall be concealed between studs of building exterior walls. Each unit shall have a meter socket with jumper plates and clear weather sealed cover. Individual meters are not required as part of this project but meter boxes with provisions for future meter cans shall be provided. Locate entrance in area readily accessible to service personnel while not distracting from the building appearance.

## 8.8.6 STREET AND AREA LIGHTING

The Contractor shall design and install a new residential roadway lighting system, including collector streets. System shall provide minimum maintained illumination levels of 0.4 footcandles, 10:1 ratio on collector streets and 0.3 footcandles, 10:1 ratio on local streets. Light poles / arms shall be "cobra-type" design with high-pressure sodium lights, all to match existing Whiteman AFB street lighting. Street light circuits shall be underground, direct burial aluminum cable. Where street light circuits cross under roadways provide PVC conduit and extend the conduit a minimum of six (6) feet beyond the edge of the roadway. Street light shall be activated by a photo cell on each circuit. Power for lighting circuits shall be obtained from transformer secondaries via breakers mounted inside secondary compartments. Existing street lights in adjoining neighborhoods shall remain and are as shown on Drawing 8.5 as included with this RFP.

## 8.9 TELEPHONE

SBC (formerly Southwestern Bell) is currently the primary provider of telecommunications services to base housing at Whiteman AFB. SBC shall install the necessary facilities to connect existing SBC infrastructure to new housing units in the new Development Area. Point of Contact at SBC: The SBC engineer for new construction at Whiteman AFB is David Brown at (660) 826-9853.

The new system wiring shall incorporate requirements necessary to update and comply with the Telecommunications Industry Association (TIA/EIA) Standard 570A for structured wiring in residences. This standard prepares a residence so that the occupants can take full advantage of broadband services available today as well as those coming in the future.

All telecommunication wiring and equipment throughout the new Development Area shall be installed as noted in this RFP. It shall be the responsibility of the Contractor to obtain from SBC any and all charges or special requirements resulting from these installation requirements. The Offeror shall include any and all costs associated with design / construction activities with Offer.

- a) The telephone system distribution lines shall be located underground in trenches per Paragraph 8.8 ELECTRICAL DISTRIBUTION, Subparagraph 8.8.1 GENERAL. However, such lines cannot be located in the same trench as any electrical lines. All new telephone service distribution lines in the Development Area shall be located in the utility easement in the Private Zone areas with service lines routed to each unit from a distribution pedestal. Refer to Part 4, Site, for additional easement criteria. The Contractor shall be responsible for assuring that all underground telephone lines are thoroughly coordinated and that they are installed in accordance with all codes, regulations, requirements, and specified clearances.
- b) SBC shall design and install the distribution network and interconnect to the existing Base network. The distribution network shall include the placement of all necessary equipment cabinets and pedestals in designated utility easement in the Private Zone areas in the Development Area. Refer to Part 4, Site for additional easement criteria.
- c) The telephone service entrance line (from distribution pedestal to housing unit) shall be run underground in one (1) inch PVC conduit. Depth of bury shall be per SBC requirements.
- d) SBC shall place demarcation equipment on the rear exterior wall of the housing units. Where duplex units occur, a separate service entrance and demarcation equipment shall be provided for each housing unit within the duplex. Mount bottom of demarcation equipment no higher than eighteen (18) inches above finish grade.
- e) SBC shall provide standard 3 pair of drops (the cable running from distribution pedestal to each housing unit), which allows for up to 3 basic phone lines **AND** 3 digital subscriber lines (also known as DSL, which is not yet available at Whiteman AFB). (Note: A duplex is considered two (2) housing units.)
- f) SBC shall provide and install all telephone wiring and devices inside the housing unit or shall approve the means and methods of same by others. Refer to Part 14, Unit Design Electrical, for information pertaining to telephone service within the Housing units.
- g) The Contractor shall schedule a coordination meeting with SBC after award of the contract but substantially prior to the required design submittals after contract award (see Section 01332 SUBMITTALS DURING DESIGN) to insure that the design of the installation is accurate and complete. The Contractor should understand that SBC generally requires a minimum of four to six (4 6) weeks for planning and engineering, scheduling, and preparation. Construction of the new network facilities generally requires another two to three (2 3) weeks. These time estimates may vary depending on items such as weather, location, size of the new area, number of units, etc.

#### 8.10 TELEVISION

Charter Communications, Knob Noster, MO will design and install the new exterior CATV cables, pedestals, and connections to the new housing units. Connections to and/or extensions of the existing system components will be required. Points of contact at Charter Communications: Terry Fuller (660) 563-3636 or Doug Newell (660) 826-6520.

The new system wiring shall incorporate requirements necessary to update and comply with the Telecommunications Industry Association (TIA/EIA) Standard 570A for structured wiring in residences. This standard prepares a residence so that the occupants can take full advantage of broadband services available today as well as those coming in the future.

All CATV cables and equipment throughout the new Development Area shall be installed as noted in this RFP. It shall be the responsibility of the Contractor to obtain from Charter Communications any and all charges or special requirements resulting from these installation requirements. The Offeror shall include any and all costs associated with design / construction activities with Offer.

a) The cable TV system shall be located underground in trenches per Paragraph 8.8 ELECTRICAL DISTRIBUTION, Subparagraph 8.8.1 GENERAL. However, the cable TV cannot be located in the same trench as any electrical lines. All new cable TV service distribution lines in the Development Area shall be located in the utility easement in the Private Zone areas with service lines routed to each unit from a distribution pedestal. Refer to Part 4, Site, for additional easement

- criteria. The Contractor shall be responsible for assuring that cable TV layouts are thoroughly coordinated and that they are installed in accordance with all codes, regulations, requirements, and specified clearances.
- b) Charter Communications shall design and install the distribution network and interconnect to the existing Base network. The distribution network shall include the placement of all necessary equipment cabinets and pedestals in designated utility easement in the Private Zone areas in the Development Area. Refer to Part 4, Site for additional easement criteria.
- c) The CATV service entrance line (from distribution pedestal to housing unit) shall be run underground in one (1) inch PVC conduit. Depth of bury shall be per Charter Communication requirements.
- d) Charter Communications shall place demarcation equipment on the rear exterior wall of the housing units. Where duplex units occur, a separate service entrance and demarcation equipment shall be provided for each housing unit within the duplex. Mount bottom of demarcation equipment no higher than eighteen (18) inches above finish grade.
- e) Charter Communications shall provide and install all necessary cable TV devices inside the housing units. The Contractor shall provide and install the cable TV wiring inside the housing unit per written criteria as provided by Charter Communications. Refer to Part 14, Unit Design Electrical, for information pertaining to CATV service within the Housing units.
- f) The Contractor is responsible for coordinating with and for ensuring that Charter Communications receives whatever information and drawings required in a timely manner to do the exterior cable TV system design. The Contractor shall arrange a coordination meeting with Charter Communications after award of the contract but substantially prior to the required design submittals after contract award (see Section 01332 SUBMITTALS DURING DESIGN) to insure the design is accurate and complete.

## 8.11 REQUIRED SITE ELECTRICAL DESIGN ANALYSIS

#### **8.11.1 GENERAL**

All design and calculations for the site electrical systems shall be performed by a licensed professional engineer with experience in family housing, and shall be stamped as such. Successful Contractor shall include a separate bound assembly of all the functional and engineering criteria, design information and calculations applicable to the project design as part of the submittals after contract award (see Section 01332 SUBMITTALS DURING DESIGN). The submittal shall be organized in a format appropriate for review, approval and record purposes.

#### 8.11.2 LOAD CALCULATIONS

- a) Calculate the demand load for each pad-mounted distribution transformer by all the demand loads (minus the HVAC load), for each type of living unit connected to the transformer, then multiply by the appropriate demand factor per NEC. Then the HVAC load and any site lighting are added to this figure to arrive at the transformer demand load. In selecting a transformer, the name plate rating shall not be less than 100% of the kilovolt amperes total load calculated for the transformer. Not more than eight (8) living units shall be supplied from one transformer.
- b) Calculate the demand load for each phase of each circuit of the primary distribution system. The loads shall be computed using the same method as outlined for the pad-mounted transformers.
- c) In addition to the complete load calculations required, provide a load summary table which group and identify each type of demand load calculated including pad-mounted distribution transformers and primary phases.
- d) Voltage Drop (VD) calculations:
  - 1) Select conductor sizes of primary feeders and calculate maximum footage for each phase of each primary circuit using a maximum allowable VD for each circuit.
  - 2) Select conductor sizes of site lighting circuits and calculate the VD for each circuit (Maximum allowable VD = 3%).

## 8.12 CATHODIC PROTECTION

Cathodic Protection (CP) is mandatory on all buried ferrous metallic structures as described below:

- a) Department of Transportation guidance as stated in 49 CFR, Part 192, requires that all metallic natural gas piping be coated and cathodically protected regardless of the soil resistivity.
- b) CP Systems shall be designed by a NACE Corrosion Engineer and shall provide protective potential to meet the requirements of the National Association of Corrosion Engineers (NACE) Standard RP-0169 or Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
- c) New or supplemental CP systems shall be compatible with existing CP systems and other adjacent structures or components. New systems should be compatible with existing systems to allow ease of repair and maintenance.
- d) CP and protective coatings shall be provided for the following buried and submerged ferrous metallic structures regardless of soil or water resistivity:
  - 1) Natural gas piping
  - 2) Fire protection piping.
  - 3) Ductile or cast iron pressurized piping under floor (slab on grade) in soil.
  - 4) Underground heat distribution and chilled water piping in ferrous metallic conduit.
  - 5) Other structures with hazardous products as identified by the installation.
- e) Cast iron pipe shall be treated as follows:
  - 1) For soil resistivity below 10,000 Ohm-cm at pipeline installation depth, provide CP, bonded joints, and protective coatings.
  - 2) For soil resistivity between 10,000 and 30,000 Ohm-cm at pipeline installation depth, provide bonded joints only.
- Copper water service lines will be dielectrically isolated from ferrous pipe. Dielectric isolation shall conform with NACE RP-0286.
- g) For ductile iron piping systems (except for ductile iron piping under floor in soil) conduct an analysis to determine if CP and/or bonded or unbonded coatings are required. Unbonded coatings are defined in ANSI/AWWA C105/A21.5.
- h) Conduct an economic analysis to determine if CP and protective coatings should be provided for gravity sewer lines and the following structures in soil resistivity conditions above 10,000 Ohmcm:
  - 1) Potable water lines.
  - 2) Concentric neutral cable.
  - 3) Other buried and submerged ferrous metallic structures not covered above.
- i) Ferrous metallic piping passing through concrete shall not be in contact with the concrete.

## 8.13 OFFER CHECKLIST FOR SITE UTILITIES

The Offeror shall include with Offer the following items as a minimum:

- O Submit conceptual proposed Site Utility Development plan for each Utility for the entire Development Area. Utilities to be shown, as a minimum, are: Water, including fire protection, Sanitary Sewer, Natural Gas and Electrical, including Street Lighting. Note: Street Lighting is only required to be shown on the detailed FY03 Task Order and FY04 Option 1 to Task Order Utility Development Plans noted below.
- o Submit detailed proposed Utility Development plan for each Utility for the FY03 Task Order portion of the Development Area.
- o Submit detailed proposed Utility Development plan for each Utility for the FY 04 Option 1 Task Order portion of the Development Area.
- o On each entire Site Utility Development Plan drawing, provide the following:

- 1. Plan drawn to scale of 1" = 300' or larger with North arrow, graphic scale, name of project, name of Offeror and date of Plan.
- 2. Proposed "connection" point(s).
- 3. The general proposed location for distribution lines.
- Proposed and potentially phased development of "looped" distribution lines where required by this RFP
- o On each detailed Utility Development Plan drawing, provide the following:
  - 1. Plan drawn to scale of 1" = 100' or larger for the FY03 Task Order and FY04 Option 1 to Task Order project sites with North arrow, graphic scale, name of project, name of Offeror and date of Plan.
  - 2. Show how typical proposed utility "easements" will be used to provide efficient distribution of utilities at the neighborhood level. Include proposed locations of transformers, switch boxes, pedestals, etc.
  - 3. Show how each utility will typically serve the individual housing units. Include proposed location of underground lines from easement to unit, proposed depths, proposed connection points at units, etc.
- On each detailed Street Light Development plan (FY03 Task Order & FY04 Option 1 to Task Order), show spacing of poles, height and design lumens at ground level. Include in the submittal, the style and design of each type of light pole proposed for use. Provide full information for roadway poles as well as trail poles, if they differ. Provide plan drawn to scale of 1" = 100' or larger with North arrow, graphic scale, name of project, name of Offeror and date of Plan.
- o Provide written description explaining how Site Utility development will take place during the initial phase(s) of work (FY03 Task Order & FY04 Option 1 to Task Order) and all potential subsequent Task Orders within the Development Area.

# PART 9 – HOUSING UNIT DESIGN/CONSTRUCTION

## **INDEX**

9	HOU	USING UNIT DESIGN / CONSTRUCTION	4
	9.1	GENERAL OBJECTIVES	4
		GOALS AND STANDARDS	
	9.3	APPEARANCE	4
	9.4	MAINTAINABILITY	5
	9.5	ADA ACCESSIBILITY	5
	9.6	FIRE PROTECTION AND SAFETY	8
	9.6.1	Fire Resistance of Party Walls and Roof Material	8
	9.6.2	2 Safety of Heater/Mechanical Rooms	8
	9.6.3	Walls Between Garage and Dwelling Units	8
	9.6.4	•	
	9.6.5	O Company of the Comp	
	9.6.6	,	
		SOUND ATTENUATION	
	9.7.1	· · · · · · · · · · · · · · · · · · ·	
	9.7.2		
	9.7.3		
	9.7.4		
		DIMENSIONS AND AREAS FOR LIVABILITY	
	9.8.1	1 · · · · · · · · · · · · · · · · · · ·	
	9.8.2		
		8.2.1 Interior/Exterior Spaces	
		LIVIBILITY – MAJOR ZONES	
	9.9		
	9.9.1		
	9.9.3	· · ·	
		LIVABILITY – MINOR ZONES	
	9.10.		
		10.1.1 Full Bath	
	9.1	10.1.2 Accessories	
	9.1	10.1.3 Exhaust Fans	
	9.10.	,	
		10.2.1 Door Clearance	
		10.2.2 Cabinets	
	9.10.		
		10.3.1 Closet Shelving	
	9.10.		
		.5 Mechanical Rooms	
	9.10.		
		CRITERIA FOR GARAGES	
	9.11.		
		11.1.1 Door Opener	
	9.11.		
	9.11.		
	9.11.		
	9.12	CRITERIA FOR ROOFING AND DRAINAGE	
			15

	9.12.2	Minimum Overhang	15
		Flashing	
		Roof Water	
		Roof Surface	
9		ERIA FOR EXTERIOR FINISHES	
٠.	9.13.1	Siding	
	9.13.2	Trim Elements	
		Painting	
		Exterior Soffits	
	9.13.5	Stucco	
_	9.13.6	Concrete Masonry Units	
9.		ERIA FOR INTERIOR FINISHES	
	9.14.1	Flooring, Stairs, and Base	
		Carpet	
		Resilient Flooring	
	9.14.4	Plastic Laminate Flooring	18
	9.14.5	Ceramic Tile	
	9.14.6	Walls and Ceilings	18
	9.14.6.1	Kitchen and Eating Area Walls and Ceiling	. 19
	9.14.7	Painting	19
9.		ERIA FOR GLAZED OPENINGS	
	9.15.1	Required Tests	19
	9.15.1.1		
	9.15.1.2		
	9.15.1.3	Air Infiltration	. 19
	9.15.1.4	Water penetration	. 19
	9.15.1.5	U-Value	. 20
	9.15.2	Glazed Doors	20
	9.15.3	Unit Efficiency	20
9.	16 Crit	ERIA FOR WINDOW UNITS	20
	9.16.1	Interior Window Sills & Trim	20
	9.16.2	Window Cladding	
	9.16.3	Single-Hung and Double-Hung Windows	
	9.16.4	Casement Windows	
	9.16.5	Screens	
	9.16.6	Window Treatments	
0		ERIA FOR DOORS	
7.		Entrance Doors	
		Patio Door	
		Garage Exterior Personnel Door and Other Exterior Doors	
		Interior Doors	
		Door Closers	
		Door Stops	
9.		eria for Builders Hardware	
	9.18.1	Locks and Keys	
	9.18.2	Weatherstripping and Exterior Thresholds	22
	9.18.3	Applications	23
9.		PERIA FOR BUILDING SIGNAGE AND DOOR BELL	
	9.19.1	Signage	
		Door Bell	
9		ERIA FOR KITCHEN/BATH CABINETS	
٦.	9.20.1	Cabinet Construction	
	9.20.1		
	9.20.1.1		
		Countertops	
	9.20.2.1		
	9.20.2.1	· · · · · · · · · · · · · · · · · · ·	
	, . <del></del>		

9.21 CR	ITERIA FOR ACCESSORY ITEMS	25
	Privacy Screening at Duplex	
	Building Envelope Tightness Testing	
	Access to Crawl Space	
	OUSING UNIT DESIGN CHECKLIST	

## 9 HOUSING UNIT DESIGN / CONSTRUCTION

#### 9.1 GENERAL OBJECTIVES

The design and construction of the individual housing units shall be as indicated in the Request for Offer. Use the guidance provided in the Air Force Family Housing Guide regarding unit design. However, the more specific guidance provided in this RFP shall control where guidance conflicts with the Housing Guide.

For the appearance of the exterior of the unit, refer also to other portions of this RFP. The design of the interior of the unit should reflect the quality of the exterior appearance.

## 9.2 GOALS AND STANDARDS

The unit design should be equal to or better than good open market housing of similar size. The resources listed below contain suggested guidance on the specific goals:

- The Not So Big House, Sarah Susanka, Taunton Press
- The New Urbanism, Peter Katz, McGraw-Hill, Inc.

#### Goals:

- 1. The unit design should create a consistency in appearance of proportion and patterns that provides a visual sense of the house.
- 2. The unit design should promote diversity and uniqueness of configurations of house designs including porches, entries, window placement, roof forms and materials.
- 3. Emphasize factors that enhance indoor and outdoor living. Consider size, layout and location of patios, balconies, yards, and features that encourage family use of outdoor areas.
- 4. Rooms should be sized and arranged for efficient use, good circulation, and furniture placement.
- 5. The distribution of space for food preparation living and dining, sleeping, bathing, halls, closets, and services should be balanced and should enhance the intended functions.
- 6. The unit design should provide views, natural light and privacy appropriate to the function of rooms and spaces within the residence.
- 7. The unit design should provide efficient circulation within the housing unit while minimizing the use of habitable rooms as hallways, unit entries, or primary circulation.
- 8. Room adjacencies should be arranged effectively so that transition areas may serve multiple purposes other than merely separational issues.
- 9. Floor plans should provide for an appropriate arrangement and layout of spaces that function and afford quality private areas for the residents.
- 10. Room organization should establish a unique identity for the house as a whole.

## 9.3 APPEARANCE

Refer to Part 1 and Part 4 for desirable exterior appearance standards. Window placement and configuration should comply with the following criteria:

- a) Windows should comprise no less than 5% of the wall area, per elevation, per floor.
- b) Individual windows (as opposed to groupings of windows) should generally be oriented vertically and have proportions between 3:5 and 5:8. However, window opening and groupings of openings should be proportional to the façade.

- c) Arched windows are undesirable.
- d) Decorative shutters are undesirable.

#### 9.4 MAINTAINABILITY

The design of housing units including the selection and specifying of exterior and interior finishes, equipment, appliances, and systems shall include consideration of maintenance ease and cost. Avoid products that require continuing maintenance at high cost.

#### 9.5 ADA ACCESSIBILITY

Access to Federal facilities by the disabled has been mandated by the *Americans with Disabilities Act* (ADA). This includes military family housing. The Air Force has set a planning and procurement goal of 5 percent (with a bedroom type/rank category per base) of all Air Force housing to be made accessible or easily modifiable to conform to accessibility requirements.

Family Housing units must be accessible not only to disabled persons with wheelchairs, but also to disabled persons who do not use wheelchairs, such as visually and/or hearing-impaired persons.

It is important to become familiar with the guidelines and responses called for by the ADA in addressing all physically challenged persons. The *Uniform Federal Accessibility Standards* (UFAS) provides excellent, comprehensive documentation, including clear diagrams and dimensions, for use in accessibility design. This document is available at no cost through the Federal Government Printing Office (GPO).

## Accessibility

Considerations	ν	In providing accessibility in common areas, recreational facilities, outdoor developed areas, and individual housing units, comply with criteria in the <i>Uniform Federal Accessibility Standards</i> (UFAS) and in the latest version of the <i>Americans with Disabilities Act Accessibility Guidelines</i> .
	v	In the designs of new units, incorporate features that would facilitate adaptation for accessibility at a later date. Examples of such features include the height of electrical switches, outlets, and other controls; the height of shelving and closet rods; opening widths; circulation patterns; the availability of accessible emergency egress; and the flexibility of the plan to permit modifications necessary to provide accessible kitchens and bathrooms.
	v	The net floor area of a unit may be increased by up to 5% to meet accessibility standards. Complete the necessary construction in a way that allows the house to be easily converted back when the family with the person with disabilities moves.  Remember that a key aspect of accessible design is to provide an "accessible" path from parking areas to all areas of the dwelling.

# Considerations (continued)

## Entry

- Design and construct common entrances to multi-unit facilities to be accessible to persons with disabilities.
- v Consult the UFAS. Provide ramps when necessary at entries. Include handrails on ramps when required. Slope ramps no greater than 1 in 12, with a 30-inch maximum rise. Provide ramps with a minimum width of 36 inches.
- Design outdoor living areas with low thresholds and adequate turnaround space.
   Consult the UFAS.

## Interior Accessibility

- v To ensure the unit is accessible, provide certain functions on the first floor, including entry, entertainment, food preparation, eating, sleeping, bathing, laundry, and storage. Provide wood or resilient flooring, or a very low-pile, dense-weave carpet to allow ease of movement. Provide accessible outdoor living spaces, such as patios, decks, and balconies, along with parking areas and walkways.
- Provide an entry door with a clear width of at least 32 inches when the door is open 90 degrees. Provide a minimum of 60 inches diameter clear space for the wheelchair inside the entrance. Provide lockset hardware (lever-handled, pushtype, or U-shaped) mounted no higher than 48 inches.
- Provide for accessibility of all first-floor rooms. Ensure all corridors are at least 36 inches wide and door clear widths are 32 inches. Provide lever-handled door hardware. Consult the UFAS for required door clearances.
- Provide windows that are within easy reach and that are operable by one hand with less than 5 pounds of force. Use casement windows with either lever or crank opening mechanisms, with locking mechanisms placed within reach of a seated person.
- v Consult the UFAS for comprehensive guidance, diagrams, and dimensions.

## **Accessibility (continued)**

# Considerations (continued)

#### Bathrooms

- v Consult the UFAS. Provide bathroom with adequate space for a person in a wheelchair to enter and close the door, use the fixtures, reopen the door, and exit.
- v Provide fixtures in compliance with UFAS.
- v Provide the necessary reinforcing for the installation of grab bars in appropriate locations per the UFAS.
- v Provide accessible shower in accordance with UFAS.
- v Provide vanity bases only if they can be removed without the use of special tools or knowledge. Finish all flooring that is located beneath removable vanity bases.

#### Kitchen

- v Consult the UFAS.
- v Provide a minimum clear floor space of 30 inches by 48 inches in front of all appliances and 19 inches under sinks.
- v Provide a minimum 60-inch clear width between cabinet fronts, counters, or walls in U-shaped kitchen areas.
- Provide kitchen sinks and the surrounding counters no more than 34 inches above the finished floor. Ensure one sink bowl is no more than 6½ inches deep with a levered or push-type faucet.
- Provide a kitchen sink with at least 30-linear inches of work surface adjacent to the sink. Consider counters designed for repositioning to a minimum height of 28 inches. Use either a single integral unit or separate components for the sink and work surfaces. Allow accessibility by a wheelchair occupant to the base cabinets directly under the sink and counter work surface by ensuring these items are removable. Ensure that when the counter is lowered, the exposed sides and back of the adjacent cabinets are constructed of a durable, non-absorbent material finish. Finish all flooring located beneath the removable cabinets.
- v Select a range with range-top controls that can be operated without reaching across burners.
- v Provide either a side-by-side refrigerator/freezer or an over/under refrigerator/freezer that has at least 50 percent of the freezer space below 54 inches above the floor.
- Provide kitchen wall cabinets with lower shelves or drawer space at a height of no more than 48 inches. Mount handles as close to the bottom of the wall cabinet doors as possible and as high as possible on base cabinet doors.

Considerations (continued)	Laundry  v When laundry equipment is provided, choose front-loading machines with controls on the front and with a minimum of 30 inches by 48 inches clear space in front of the equipment with the doors open.
	Tactile and Audible Considerations
	v Ensure that the requirements for the visually and hearing impaired are also reviewed.
	v Use the above points only to provide an outline for some of the key points of accessible design. It is imperative that the housing project manager and the design architect-engineer consult the ADA and UFAS in addressing accessibility requirements.

## 9.6 FIRE PROTECTION AND SAFETY

Housing units will comply with the applicable National Fire Codes, including NFPA 101, Life Safety Code (which includes egress elements such as stairs, handrails, door widths, etc.) except that stair risers shall be maximum 7-1/2 inches high and treads minimum 10-1/2 inches long. Construction features will be provided in accordance with the International Residential Code (IRC).

#### 9.6.1 FIRE RESISTANCE OF PARTY WALLS AND ROOF MATERIAL

Party walls shall extend without openings, from ground to the underside of roof sheathing. Provide firestops at floor, and ceiling or roof line. Provide Class A (ASTM E108, Standard Methods of Fire Tests of Roof Coverings) roof covering material throughout. Party walls (walls separating housing units) shall have the minimum fire-resistance ratings shown below:

a) Duplexes, UL-rated one hour fire resistance.

## 9.6.2 SAFETY OF HEATER/MECHANICAL ROOMS

Rooms equipped with fuel-fired equipment such as a furnace and/or fuel-fired water heater that serve only one housing unit shall be lined with 2 layers of ½ inch gypsum board or equivalent noncombustible material. Easy access to the furnace filter shall be provided; the filter shall not be located in the furnace enclosure. Refer also to Part 3 for energy conservation and sustainability criteria and Part 13 for HVAC design.

## 9.6.3 WALLS BETWEEN GARAGE AND DWELLING UNITS

For walls between garage and dwelling units, provide UL-rated one-hour fire resistance.

#### 9.6.4 ALARM SYSTEMS

Smoke detectors shall be provided within the housing unit in accordance with the requirements of Part 14.

#### **9.6.5** EGRESS

Every sleeping room and living area shall have a secondary means of egress where required by and in accordance with NFPA 101 and International Residential Code (IRC).

#### 9.6.6 TORNADO SAFE ROOM

Provide every unit with a tornado "safe room" built in accordance with the standards in the Federal Emergency Management Agency's publication "Taking Shelter From the Storm: Building a Safe Room Inside Your House," FEMA 320. Refer to the Attachments to the RFP for the 16-page set of approved drawings dated "Revised August 1999" indicating various methods for meeting the standards. For accessible units, the preferred location of the safe room is on the main level of the unit. Note that an In-Ground (IG) shelter located with the entrance at or near the bottom of the steps up from inside the garage into the living spaces would be a) most likely the least costly shelter, and b) the only situation – or one of the few situations – in which the shelter would not contribute to the overall gross square feet calculations.

### 9.7 SOUND ATTENUATION

#### **9.7.1 TESTING**

Certified proof-of-performance field tests will be conducted to demonstrate that the wall systems as constructed provide the required sound isolation. Tests for air-borne sound shall be made in compliance with ASTM E336. Testing of 10 percent (minimum) of each type of wall system is required. Location of test sites will be chosen at random by the Contracting Officer.

- a) Any wall system found to be inadequate shall have the deficiencies corrected and the additional qualifying tests conducted at the Contractor's expense. Testing at the Contractor's expense of greater than 10 percent of each system may be required if the Contracting Officer determines that the quality of construction requires this additional testing.
- b) Walls shall be designed to meet or exceed the requirements stated below. In cases where the field tested performance of the systems does not meet the designed performance, the maximum acceptable difference between field tests and sound transmission ratings shall be 2 decibels (dB) for airborne sound ratings and 5 dB for impact sound ratings.

#### 9.7.2 PARTY WALLS

It is strongly preferred that party walls between dwelling units provide totally independent wall and floor systems between units. Party walls (walls separating adjacent dwelling units) shall be designed to provide the minimum airborne sound transmission ratings stated in Table 9-2.

TABLE 9-2 - SOUND TRANSMISSION STANDARDS FOR PARTY WALLS

Area	FSTC <sup>1</sup>	
Party Walls (except none at party walls between garages)	52	

Note<sup>1</sup>: Field Sound Transmission Class. See ASTM E336. FSTC 60 is preferred.

## 9.7.3 PLUMBING AND HVAC EQUIPMENT

Design of plumbing and Heating, Ventilating and Air-Conditioning (HVAC) equipment shall include design provisions such as location, enclosure and acoustical treatment, to minimize transmission of noise generated by equipment within each housing unit and to eliminate transmission of noise to other housing units.

#### 9.7.4 OTHER AREAS

For minimizing transmission of noise between rooms within an individual unit, follow the guidelines contained in paragraph 4.8.1 of the Air Force Family Housing Guide.

## 9.8 DIMENSIONS AND AREAS FOR LIVABILITY

## 9.8.1 INTERIOR PLAN REQUIREMENTS

The functional area relationships contained in the Air Force Family Housing Guide paragraph 4.8 Interior Plan Requirements should be used as a desirable guideline. Use a combination of "open" and "formal" living plans when designing the living areas of the different floor plans. When designing interior spaces consider the aesthetics of the space and how the use of ceiling heights and/or the use of decorative moldings can be used to add interest to the space. Design elements such as trim moldings, built-ins, window seats, and extra shelving are desirable features.

#### 9.8.2 MINIMUM AREAS

#### 9.8.2.1 Interior/Exterior Spaces

Minimum areas/dimensions for interior spaces need to follow the guidelines contained in the Air Force Family Housing Guide paragraph 4.8.

Ceiling heights in habitable rooms shall be a minimum of 8 feet. Ceiling heights can be reduced in parts of these rooms to 7 ft to accommodate ducts.

Halls and stairways to habitable spaces shall have a minimum clear horizontal width of 3'-3" measured between railings.

## 9.8.2.2 Kitchen Cabinets, Counters and Pantries

See Table 9-5 for minimum guidelines. Flat area is shown for countertops and drawers. Combined shelf area is shown for pantry and base, wall and wall cabinets. Refer to paragraph 4.8.3 (Figure 4.23) of the Air Force Family Housing Guide for clarification, including increased sizes for Senior Officer units.

Type of Housing	Wall		Base		Drawer		Counter		Pantry Area	
Housing Unit		$ft_2$		$\mathrm{ft}^2$		ft <sup>2</sup>		$\mathrm{ft}^2$		$ft^2$
Тур.		28		28		14		20		Required

TABLE 9-5 - KITCHEN CABINET, COUNTER, & PANTRY AREA

## 9.9 LIVIBILITY – MAJOR ZONES

#### 9.9.1 LIVING AND DINING

It is desirable for the living room to have direct access to the front entrance vestibule and to the dining area without passing through another room. The dining area may be an extension of, or an "L" off the living room. It is desirable for the dining area to be directly accessible from the kitchen without passing through another room. For Senior Officer (SNCO) family units, provide separate dining rooms or areas to accommodate furniture and seating for not fewer than 10 persons.

#### 9.9.2 KITCHEN AND AUXILIARY DINING AREA

- a) The kitchen shall provide an efficient work triangle and the following desirable criteria. A base cabinet, minimum 15 inches wide, should be provided on the handle side of the refrigerator. The range should not be located adjacent to the refrigerator, in a corner, adjacent to a passageway, or under or within 1' either side of a window opening. The dishwasher should be installed convenient to the kitchen sink, but such that the open dishwasher door does not conflict with the space immediately in front of the sink.
- b) Space for a tenant-owned upright freezer shall be provided adjacent to the kitchen or in area such as a laundry or utility room. Freezer area shall not be located in garage and shall have direct access into the unit
- c) Space shall be provided in the kitchen for a tenant-owned microwave oven 15" high, 15" deep and 26" wide. Provide a space within the cabinets, as not to use countertop space.
- d) It is desirable to provide a secondary dining area. This can be a "breakfast bar" extending from the kitchen, or table space in the kitchen or in a family room adjacent to, or as an extension of, the kitchen. It is also desirable that the secondary dining area have "hard" flooring (not carpet). The secondary dining area shall not be located in the living or dining rooms.

#### 9.9.3 BEDROOMS

Bedrooms shall be designed to accommodate king-size beds in master bedrooms and twin beds in the other bedrooms. Window, door, and closet placement should enhance furnishability. Each bedroom shall be accessible without passing through another bedroom. Design consideration shall be given to the movement of oversized furniture in and out of the bedrooms. Bedroom closets shall maximize closet space with wood shelving and organizers. As a minimum provide 2 rods and 2 shelves in 50 percent of the hanging space with shelves at approximately 3'-8" and 6'-0" above the floor. The remainder of the hanging space shall have one rod and one shelf for hanging items such as dresses.

## 9.10 LIVABILITY – MINOR ZONES

#### 9.10.1 BATHROOMS

Emphasis shall be placed on size, fixtures, layout, and privacy. Direct access to a bathroom from the master bedroom is required for three bedroom and four bedroom units. Compartmented bath design, for family and guest use, is encouraged. Determine the number of bathrooms based on Table 9-8. Minimum door widths for bathrooms shall be 2'-6". Door widths for units designated for potential use by persons with disabilities, shall conform to accessibility standards. In the shared or family bath, lavatory vanities shall be separate from the tub/water closet area. Provide at least one bathroom compartment that has no wall common with the exterior of the unit. It is desirable for this compartment to be on the main level of the unit.

## TABLE 9-8 – BATHROOM REQUIREMENTS

BEDROOMS Upstairs / BEDROOMS Downstairs	BATHROOMS Upstairs / BATHROOMS Downstairs
0 up / 2 down	0 up / 1 down

TABLE 9-8 – BATHROOM REQUIREMENTS

BEDROOMS Upstairs / BEDROOMS Downstairs	BATHROOMS Upstairs / BATHROOMS Downstairs
0 up / 3 down	0 up / 2 down
0 up / 4 or 5 down	0 up / 2.5 down
1 up / 1 down	1 up / 1 down
1 up / 2 down	1 up / 1 down
1 up / 3 down	1 up / 2 down
1 up / 4 down	1 up / 2 down
2 up / 0 down	1 up / 0.5 down
2 up / 1 down	1 up / 1 down
2 up / 3 down	1 up / 2 down
3 up / 0 down	2 up / 0.5 down
3 up / 1 down	2 up / 1 down
3 up / 2 down	2 up / 1 down
4 up / 0 down	2 up / 0.5 down
4 up / 1 down	2 up / 1 down

#### 9.10.1.1 Full Bath

A full bath shall contain a water closet, lavatory, vanity, and a tub with shower assembly (Note: Tub with shower assemblies shall not be placed under windows). At least one full bath shall be provided in each family unit. One full bath in each housing unit shall be directly accessible from the bedroom hall without passing through another room. Tubs with shower assemblies shall include shower rods without shower curtains, without tempered glass or plastic enclosures and doors. A half bath contains a lavatory and a water closet. At units with 3 or more bedrooms, provide a four piece compartmented master bath: A two-lavatory vanity in one compartment, and a second compartment with water closet and a tub with shower assembly. At senior NCO and officer master bedrooms, provide a five piece compartmented master bath: A two-lavatory vanity in one compartment, and a second compartment with water closet, separate shower of at least 4 feet in one plan dimension, and soaker or garden tub of at least 18 inches in depth.

#### 9.10.1.2 Accessories

Bathroom accessories shall be non-corroding metal or ceramic tile, and shall consist of a recessed toilet paper holder, recessed combination soap dish and grab bar at tub/shower stall, two bathrobe hooks and two towel bars, totaling not less than 42 inches for a full bath, or one or two bars not less than 30 inches for a half bath. A non-corrosive shower curtain rod is required. There shall be a mirror the whole width of the lavatory vanity. The top of the mirror shall be at 7'-0" above finish floor. A medicine cabinet shall be provided on a side wall in each bathroom. Medicine cabinets shall be the hinged door type, located on side wall adjacent to mirror, and shall be recessed. Do not place in a party wall.

#### 9.10.1.3 Exhaust Fans

Exhaust fans with minimum 70 cfm shall be provided in all baths, shall be switch operated separately from the lights and shall be ducted directly to the exterior of the building. Refer also to Part 3 for energy performance requirements.

#### 9.10.2 LAUNDRY WASHER AND DRYER

A separate laundry room with a full width cabinet over washer/dryer area is desirable. Coordinate location of laundry room/dryer to assure compliance with dryer vent requirements specified in Part 13 under Dryer Vents. A

base cabinet with a laundry sink is considered a betterment. Refer also to Part 3 for energy criteria and to Part 11 for plumbing criteria.

#### 9.10.2.1 Door Clearance

Swing of doors shall not conflict with operational space in front of washer/dryer appliances.

#### 9.10.2.2 Cabinets

All cabinetry works in the laundry room shall be of comparable quality to the kitchen cabinets.

#### **9.10.3 CLOSETS**

A broom closet shall be provided convenient to the kitchen. A coat closet with side-hinged door, 12-inch deep shelf, and clothes rod for full length items is desirable in the entry vestibule.

#### 9.10.3.1 Closet Shelving

Closet shelving and rods 3'-0" to 3'-8" in length shall have one intermediate support, and 3'-9" to 5'-6" in length shall have two intermediate supports. Shelves and rods longer than 5'-6" shall have at least three intermediate supports. Shelves and supports shall be capable of carrying 35 lbs./ft. Closet shelving construction shall match requirements for kitchen cabinet shelving in 9.20.1, except 1) double smoothing melamine top coat on upper side only, and 2) 1-inch high hardwood edging at front face, stained and sealed. Linen closets shall be provided with at least four full-depth shelves.

## 9.10.3.2 Closet Doors

Closet doors should be located to permit placement of furniture in the corners of the rooms by providing an 18-inch return adjacent to a furnishable wall. For closets 6 ft or more in width a pair of side-swinging doors hinged from the closet doorjambs is preferred. Sliding doors are acceptable. For closets less than 6 ft in width a single side-swinging door is preferred. Bifold closet doors are not desired.

#### 9.10.4 BULK STORAGE

Provide each housing unit with interior and exterior bulk storage space meeting the minimum requirements of paragraph 4.7 and 4.8 of the Air Force Family Housing Guide. Provide interior storage in a separate room. Provide exterior storage in the garage. A door directly to the exterior is desirable. A separate storage area for the trash containers should be accommodated in the garage. The trash container area should be large enough to hold two standard garbage cans, one recycle container (18"Wx26"Lx14"D), and one 90-gallon yard waste container (3'-0"Wx4'-0"Lx3'-6"D).

- a) For size of exterior bulk storage areas, refer to paragraph 4.8.3 of the Air Force Family Housing Guide.
- b) Bulk storage space should be at least 4 ft in depth and a minimum clear height of 6 ft-6 inches, except that space under stairs may be counted at 1/2 area if the space is 4 ft or more in height.
- c) Provide a minimum of three deep shelves with a combined length of 24 ft within each bulk storage room (both exterior and interior). Provide shelves and supports capable of carrying 35 lbs./ft over entire length of shelf.
- **d**) When a garage personnel door is provided, a location both to exterior storage and to the trash area is highly desirable.

e) Common walls and ceilings between adjacent storage areas shall be finished on both sides.

#### 9.10.5 MECHANICAL ROOMS

Water heater, furnace, electrical panel and telephone and cable television distribution boxes shall be located in a separate mechanical room, or in a dedicated area within the garage. The goal in locating these items is to locate them as so as not to interfere with usable storage space in the garage but place them in an accessible area for maintenance personnel without having them track mud and drag tools into the private living space of the family home. Size room with minimum dimensions commensurate with providing adequate space for servicing/replacing the equipment located therein. As a betterment, provide the mechanical room with dual access from inside the unit (either from conditioned space or from the garage), as well as from the building's exterior (outside the backyard's fence). If a dedicated area of the garage is used, place the furnace and the water heater on a bare, raised concrete slab with separation walls constructed to ensure the occupant will not use the area for storage and that the occupants adjacent garage storage area will be kept separate from the mechanical area. The preferred location for the access door to the crawl space is in the floor of the mechanical room. If this is not possible, locate such access door in the floor of a ground floor closet that has adequate available floor space.

#### 9.10.6 PATIOS

As a minimum the concrete patio area shall be sized to accommodate simultaneous use of the following equipment/furnishings and activities; patio table with umbrella and chairs to seat 6, 2 patio chase lounge chairs or 2 upright chairs each with a small side table to hold a book or drinks, and a portable gas grill with side racks. Slope patios to drain. At a minimum, provide a broom-finished concrete surface. Patterned and colored concrete patios are a betterment.

## 9.11 CRITERIA FOR GARAGES

For each housing unit, provide an attached garage. Two-bedroom units shall have a one-car garage. Units with 3 or more bedrooms shall have a two-car garage. For "Prestige" and SOQ units, locate two-car garage such that an additional contiguous garage space may be added in the future. Design all units so that resident can access the garage directly without going outside. Garage floors shall be concrete and shall have a construction joint installed between the garage and driveway paving. A single car door shall be a minimum 9 feet wide. A double car garage door shall be a minimum 16 feet wide. In the open position a minimum clear height of 8'-0". Sound attenuation is not required for units planned as "Duplex" housing units, where only the garages become the separating elements between the living units. Such garage party walls shall be minimum one-hour fire rated, with 5/8" gypsum wallboard, both sides, full height to bottom of roof sheathing. Set the garage slab elevation a minimum of 4 inches below the level of the housing unit floor. Slope slabs to drain out the garage door.

## 9.11.1 OVERHEAD GARAGE DOORS

Sectional overhead garage doors shall be insulated with steel sandwich panel, SDP-38 by Phenix or approved equal, with white pre-finished sides and with minimum 26 gauge embossed pebble-grained textured acrylic polyester coatings on exterior and shall have hardware that can be opened and locked from inside and outside of the garage. Garage door shall be insulated to approximately R-8. Some glazed openings in the sectional overhead door are considered a desirable feature. Refer to Part 3 for general energy conservation and sustainability criteria.

#### **9.11.1.1 Door Opener**

Provide an electrical outlet on the ceiling of the garage for the future installation of a garage door opener.

#### 9.11.2 WALLS & CEILING

Provide gypsum wallboard on the walls and ceiling with taped joints and mudded nail holes. Paint and texture is not required. Refer to Part 3 for general energy and conservation and sustainability criteria.

#### 9.11.3 INSULATION

All garage walls and ceilings (both between the exterior and the interior and between the garage and the rest of the housing unit) shall be insulated as if they were part of the exterior envelope. Refer also to Part 3 for general energy conservation and sustainability criteria.

## 9.11.4 UTILITY SINK

Locate a utility sink on one interior wall of the garage. Refer to Part 11 for the sink design criteria.

#### 9.12 CRITERIA FOR ROOFING AND DRAINAGE

The designs shall have hip or gable-end pitched roofs. Refer to Part 1 for desirable exterior appearance images.

#### 9.12.1 MINIMUM SLOPES

Minimum slope for primary roof is 6:12. Preferred slope for primary roof is 8:12.

Minimum slope for secondary roof is 4:12.

Minimum slope for porch or patio roof is 2:12.

#### 9.12.2 MINIMUM OVERHANG

Overhang shall be appropriate to the housing style/design. Typical roof overhang shall be 24" for hip roofs and 24" for eaves, except at steeply raked roof conditions maintain a minimum eave of 12". Minimum gable overhang shall be 3".

#### 9.12.3 FLASHING

Flashing shall be of nonferrous material.

#### 9.12.4 ROOF WATER

Seamless pre-finished aluminum gutters and downspouts shall be provided for all roof areas. Locate downspouts at the outside corners of buildings in order to discourage ponding of water against corners of the foundation wall. Avoid draining downspouts across pavement. Downspouts draining onto a lower roof are not desirable, but if utilized shall have metal or plastic splash deflectors. Downspouts shall not empty onto the patio area or onto exterior door entry landings. Downspout extensions emptying onto concrete splash blocks shall be provided.

#### 9.12.5 ROOF SURFACE

Roofing shall be limited to the following:

a) Minimum of Class A wind-resistant glass-fiber-reinforced asphalt shingles similar to Timberline Ultra laminated strip shingles by GAF Materials Corporation, conforming to ASTM D3462, Specification for Asphalt Shingles Made from Glass Felt and Surfaced With Mineral Granules, containing a 40 year product warranty and a 80 mph wind rating.

- b) An ice dam preventer such as "Weather Watch" shall be provided at eaves, valleys, and gable ends.
- c) Common roofs. Parapet walls are prohibited.

## 9.13 CRITERIA FOR EXTERIOR FINISHES

Refer to Part 4 for requirements for material and color palette variety. Emphasis shall be placed on low maintenance and durability for exterior finish materials. Materials shall be residential in size, scale, and texture. The colors should be selected so that no two adjacent structures are colored alike, yet the selected colors of one should harmonize with its neighbors. Siding of the following materials shall be used:

#### **9.13.1 SIDING**

Siding with a high quality appearance is required. In addition, siding shall have a minimum non-prorated 10-year warranty on the finish. Siding shall be kept a minimum of 6 inches above finish grade. Siding shall be either single pieces with maximum width course or single pieces shaped to simulate width courses between 6 and 8 inches. Siding shall be installed in accordance with manufacturer's recommendations. A manufacturer's representative shall instruct the installer of the siding, appurtenances, and accessories as to the manufacturer's required installation procedures. The Government construction inspectors responsible for the job shall be included in their instruction. Panel materials in large surfaces shall be avoided unless surfaces are broken with textures or battens. Battens for prefinished materials shall also be factory finished. Refer to Part 3 for guidance on exterior wall construction for energy conservation and sustainability. The following siding materials are to be used:

- Portland Cement siding in a variety of styles, such as manufactured by James Hardie Building Products
- Masonry veneers of brick, stone, or cast stone (such as manufactured by Eldorado, Coronado or Owens Corning).

## 9.13.2 TRIM ELEMENTS

Trim and flashing shall be compatible with the roofing and siding materials.

## **9.13.3 PAINTING**

Exterior surfaces requiring painting every 5 years shall be kept to a minimum, but where painting is absolutely necessary, exterior surfaces shall receive a minimum of one prime coat and two finish coats of paint.

#### 9.13.4 EXTERIOR SOFFITS

Exposure of roof framing and underside of roof/floor decks are not permitted. Exterior soffits will be trimmed or otherwise architecturally treated and coordinated with siding. Provide exterior soffits with vented holes. Excess attic ventilation shall not be provided through the use of only vented panels. A combination of non-vented and vented panels shall be used. Vented panels shall be evenly spaced along the eaves. Acceptable materials include:

- Prefinished Portland Cement board ceiling or soffit panels.
- Preformed and pre-finished metal soffit panels.
- Preformed and colorfast vinyl soffit panels.

## 9.13.5 STUCCO

Portland cement plaster or synthetic stucco or any type of Exterior Insulation Finish System is **prohibited** on this project.

## 9.13.6 CONCRETE MASONRY UNITS

Concrete masonry units shall not be used as a foundation system or as an exterior wall material.

## 9.14 CRITERIA FOR INTERIOR FINISHES

The color, texture and pattern selections for the finishes of the housing units shall provide a warm, comfortable, easily maintainable and functional environment for the occupants. Coordination of finish colors is necessary for a cohesive design. The design should include neutral colors that accommodate the occupant's varied furnishings. Provide wood base throughout the living areas of the housing units. Countertops shall have patterns that are mottled, flecked or speckled.

## 9.14.1 FLOORING, STAIRS, AND BASE

Floor materials shall be appropriate for the specific uses planned for that area of the housing unit. Consider where changes of floor materials are made so that a logical "flow" of the flooring occurs. Porcelain tile shall be used as a walk off area at all front entry foyers. Living rooms and dining rooms shall be carpeted. Family rooms shall be carpeted, but when adjacent to the kitchen area to be usable as an alternate dining room, flooring should be sheet vinyl. Kitchens, bathrooms, laundry, utility and mechanical room flooring shall be heavy-duty (seamless) sheet vinyl resilient flooring over underlayment. All bedrooms, stairs to bedrooms, and hallways to bedrooms shall be carpeted. Base throughout shall be oak, stained and sealed. As a betterment, provide plastic laminate flooring with a wood appearance (e.g. Pergo) for the front entry, living, dining and family rooms combined. Refer to Table 9.14.1 for clarification.

**TABLE 9.14.1** 

FLOORS	BASIC	BETTERMENT
FRONT ENTRY (as a walk-off)	Porcelain tile with sealed grout over cement board subflooring	Plastic laminate flooring with a wood appearance (e.g. "Pergo") – (if in conjunction with the living, dining, and – if appropriate – family room)
LIVING ROOM and DINING ROOM	Carpet	Plastic laminate flooring with a wood appearance (e.g. "Pergo") – (if in conjunction with the front entry and – if appropriate – family room)
FAMILY ROOM	Carpet	Plastic laminate flooring with a wood appearance (e.g. "Pergo") – (if in conjunction with the front entry, living room, and dining room)
KITCHEN	Heavy-duty (seamless) sheet vinyl over underlayment	(none)
LAUNDRY / MECHANICAL areas	Heavy-duty (seamless) sheet vinyl over underlayment	(none)
BATHROOMS	Heavy-duty (seamless) sheet vinyl over underlayment	(none)
BEDROOMS, as well as HALLWAYS & STAIRWAYS to bedrooms	Carpet	(none)

#### 9.14.2 **CARPET**

Carpet color shall be neutral (not light in color) and pattern is to be avoided. Carpet shall be woven, tufted or fusion bonded construction. Carpet type shall be plush cut, frieze (twist), cut and loop, or loop. Minimum face weight shall be 32 ounce for plush cut, 28 ounce for cut and loop or frieze (twist) piles or 24 ounce for loop pile. Synthetic (polypropylene) backing is required. A minimum pile density of 4000 and gauge of 1/8 or 1/10 is required. Specify yarn that is branded by the fiber producer, Nylon-6, 6, or Nylon-6 with a soil and stain resistant finish. Provide 3/8" to ½" high-density polyurethane foam underlayment that meets HUD Use of Material Bulletin 72A HUD Building Product Standard and Certification Program for Carpet Cushion. Carpet must pass the Department of Commerce (DOC) FF 1-70 Pill Test (7 passes from 8 specimens) and the requirements of NFPA 101, The Life Safety Code. Carpet shall comply with 16 CFR 1630 and have a minimum average critical radiant flux of .45 watts per square centimeter when tested in accordance with ASTM E 648. Tuft bind force required to pull a tuft or loop free from carpet backing shall be a minimum 10 pound average force for loop pile and 3 pound average force for cut pile when tested in accordance with ASTM D 1335. Carpet shall be installed according to the manufacturer's recommendations to ensure that warranties will be valid.

#### 9.14.3 RESILIENT FLOORING

Sheet vinyl shall conform to ASTM F 1303, Type II, Grade 1 minimum wear layer thickness of 1.25 mm and minimum overall wear layer thickness of 2 mm. Install to minimize need for seams. Where room size require seams, apply waterproof epoxy adhesive continuously in all seams in accordance with the manufacturer's instruction. Provide extruded vinyl edge moldings where flooring materials change and where appropriate in open plans. Provide "quarter round" at wood base wherever resilient flooring is installed.

## 9.14.4 PLASTIC LAMINATE FLOORING

If provided, laminate flooring shall be installed using glued tongue and groove panels, minimum size 7" (nominal) by 48" (nominal) with a 5/16" nominal thickness. Provide a 15-year warranty against wear, fading, staining and moisture absorption. Install over a sound reduction underlayment.

## 9.14.5 CERAMIC TILE

Ceramic or porcelain tile shall conform to ANSI AI37.1, moderate to heavy grade only. Nominal 12" x 12" tile is preferred by the entryways, but in no case shall floor tiles be less than 4" x 4" nominal. Subflooring under tile shall be cement board. Tile and trim shall be unglazed with the color extending uniformly through the body of the tile and equal to Daltile. A mottled or speckled floor tile should be used for maintenance purposes. A medium to dark toned grout that coordinates with the floor tile is required to avoid a stained or soiled appearance.

#### 9.14.6 WALLS AND CEILINGS

Interior wall finish material shall be ½ inch minimum gypsum wallboard. Ceiling finish material shall be 1/2 inch gypsum wallboard. Wherever framing is spaced over 16" O.C., gypsum wallboard shall be 5/8 inch thick. Finish gypsum wallboard with a light orange peel texture as a base under painted surfaces. Do not furnish sprayed-on acoustical ceiling finish in any area of this project. Water-resistant wallboard shall be used in wet areas such as bath, powder, and laundry rooms. "Cement" or glass-fiber reinforced backer board is preferred. Interior finish shall have a flame-spread rating of 25 or less and a smoke-developed rating of 50 or less when tested in accordance with ASTM E84.

Small amounts of masonry veneer, as used on the exterior, may be used for interior feature walls. However, such material should require minimum maintenance and be capable of withstanding moderate physical impact for its common accepted use.

All receptacle boxes and electrical switches shall be masked prior to gypsum wallboard taping to prevent gypsum wallboard cement from entering electrical boxes or touching sheathing on electrical sheathed cable.

## 9.14.6.1 Kitchen and Eating Area Walls and Ceiling

Combined kitchen and eating rooms shall have the same type of wall and ceiling finishes. However, provide a splatter guard of glazed ceramic tile or 1/16" (minimum thickness) prefinished metal (or metal-faced composite) at the wall behind the range top. Splatter guard shall extend from the level of the countertop up to the range hood, and a minimum of 6 inches beyond each edge of the range top area.

#### **9.14.7 PAINTING**

Finishes shall be lead free. Interior surfaces, except factory prefinished material, shall be painted a minimum of one prime coat and two finish coats, except if stained and varnished oak trim is utilized. Natural finished interior doors are acceptable. Walls and ceilings in kitchen, baths, laundry, utility rooms shall be painted with semi-gloss epoxy base. Painted trim shall be semi-gloss. Two coats. Provide natural stain and sealer on Oak trim. All other painted surfaces shall have semi-gloss latex finish. Interior wall color shall be off-white. It is desirable for ceilings to be a lighter white than the walls. Final colors shall be submitted by the Contractor and approved by the Contracting Officer.

## 9.15 CRITERIA FOR GLAZED OPENINGS

Windows and glazed door (50 percent or more glass) units shall meet the following standards and must be certified by an independent testing laboratory. Operable windows shall be single-hung, double-hung, or casement, but double-hung is preferred. Standards for casement windows shall also apply to fixed windows. Glazing for windows at bathrooms shall be patterned or obscured. Refer also to Part 3 for energy conservation and sustainability criteria. The Contractor shall provide the manufacturer's certification that the windows/glazed doors provided meet the following test requirements:

## 9.15.1 REQUIRED TESTS

Hung window units will meet a National Fenestration Rating Council (NFRC) design pressure rating of DP 25. Casement windows will meet NFRC design pressure rating of DP 40. Evidence of passing the following specific tests and minimum standards are required to achieve these design pressure standards.

## 9.15.1.1 Structural Testing

Using ASTM E330 test results shall demonstrate no glass breakage, damage to hardware, or permanent deformation that would cause any malfunction or impair the operation of the unit. Residual deflection of any member shall not exceed 0.4 percent of its span. Hung windows shall be tested at pressures of 37.5 lb/ft², and casement windows shall be tested at pressures of 60.0 lb/ft².

## 9.15.1.2 Operating Force

The force necessary to unlatch and open units shall not exceed 30 lb. for hung units and 35 lb. for casements.

#### 9.15.1.3 Air Infiltration

Using ASTM E283 leakage rate shall not exceed 0.25 ft<sup>3</sup>/min/ft<sup>2</sup> for hung units and 0.15 ft<sup>3</sup>/min/ft<sup>2</sup> for casements, at a test pressure of 1.57 lb/ft<sup>2</sup>.

## 9.15.1.4 Water penetration

Using ASTM E547, no leakage shall be evident when tested in three, five-minute cycles with a one-minute rest period between cycles at 3.75 lb/ft<sup>2</sup> for hung units and 6.0 lb/ft<sup>2</sup> for casements.

#### 9.15.1.5 U-Value

U-values shall be calculated using ASTM E1423 and NFRC 100-91. Refer to Part 3 for energy conservation and sustainability criteria.

#### 9.15.2 GLAZED DOORS

Glazed doors shall have insulated steel, vinyl clad wood, or thermally broken aluminum frames conforming to the above requirements. Finish shall be factory applied and conform to 44-C-22431 in accordance with the requirements of the National Association of Architectural Metal Manufacturers (NAAMM) Metal Finishes Manual. Doors shall have interior operated latch, and securing pin or throw-bolt in frame.

#### 9.15.3 UNIT EFFICIENCY

Glazing units shall be high efficiency, low E, double glazed (insulated) with a minimum 5/8 inch air space and thermal-break and 10 year warranty. Provide sashes that can be site glazed.

## 9.16 CRITERIA FOR WINDOW UNITS

Windows with metal sashes or jambs on the interior are not permitted. Windows with wood sashes or jambs on the exterior are not permitted. Windows in "double height" spaces should be avoided because of the difficulties in cleaning such windows and providing window blinds for them. All windows shall be operable in the living room, dining room, family room, kitchen and bedrooms.

#### 9.16.1 INTERIOR WINDOW SILLS & TRIM

Interior side of window sills shall be solid surfacing or clear oak suitable for application of stain and varnish by Contractor. Paint finish is <u>unacceptable</u> at window sills. Provide wood trim at all interior window jambs and heads. Provide either stained and sealed oak, or wood with paint finish.

## 9.16.2 WINDOW CLADDING

Windows shall conform to AAMA 101/I. Vinyl windows shall conform to AAMA 101/AAMA 101V, with fully mitered fusion welded joints at vinyl frames and reinforced with aluminum extrusions or roll-formed galvanized steel members if required.

## 9.16.3 SINGLE-HUNG AND DOUBLE-HUNG WINDOWS

Windows shall be Grade H-LC35 with sash which operates vertically with the weight of sash offset by a counterbalancing mechanism mounted in window to hold the sash stationary at any open position, and shall be complete with two locking devices to secure the sash in the closed position. Single-hung windows shall be designed to permit washing of both sides of the operable sash from inside the unit. Double-hung windows shall be designed to permit washing of both sashes from inside the unit.

## 9.16.4 CASEMENT WINDOWS

Windows shall be Grade C-R90 with ventilator sash that swings on side jambs and shall have locking devices to secure ventilators tight in the frame in the closed position. Operator shall be rotator type. Operating hardware except ventilator arms and rotary operators shall be concealed within frame and sill.

## **9.16.5 SCREENS**

Aluminum screens shall be provided at all operable sashes. Screens shall be of window manufacturer's standard design, and conform to AAMA 1002.10, Voluntary Specification for Aluminum Insulating Storm Products for Windows and Sliding Doors.

#### 9.16.6 WINDOW TREATMENTS

Provide blinds at all windows. Typically provide horizontal 1inch metal blinds at windows less than 5'-0" wide, and provide vertical blinds on a transverse rod with PVC louver vanes about 3-1/2' wide at wider windows and where glazed patio doors occur. Blinds are not required at bathroom windows with patterned or obscure glazing. Window coverings are optional at any glazing in entrance doors, entrance sidelights and entrance door transoms. Color shall be manufacturer's standard off white, and shall be coordinated with wall color.

## 9.17 CRITERIA FOR DOORS

Refer to Part 3 for energy performance requirements.

## 9.17.1 ENTRANCE DOORS

The entrance door at the housing unit's front entry shall be 3 ft in width and minimum 6 ft-8 inches in height. Door shall be 1-3/4 inch thick, insulated, pre-finished solid core steel exterior with decorative panel treatments embossed into both face sheets (similar to Versador by Ceco Corp.). No storm door is required at the front entry. Sliding glass doors shall not be used as primary housing unit access. Other doors should meet this requirement but may be of lesser width.

The following are considered desirable features at the front entry door:

- Exterior of door is accent color.
- Sidelights on one or both sides.
- Transoms above door.
- Small amount of glazing in door.
- Any glazing in door, sidelights, or transom shall be transparent and clear versus tinted or colored. For privacy, however, glazing at eye level and below should be patterned, embossed, beveled etc. versus flat panel glass.

## 9.17.2 PATIO DOOR

Door to patio shall be in-swinging hinged double 30 inch wide glazed doors with one door fixed and the other door active, meeting the requirements of NWWDA I.S. 8. Patio Door or equivalent quality, and I.S. 2 Window Rating grade 60. To provide more latitude with arrangement of furniture, the inactive door leaf may be reduced in size or eliminated, as long as the width of the active door leaf is increased in order to provide a minimum clearance of 34". Wood door (prefinished or natural and stained) with exterior cladding is considered a desirable feature.

#### 9.17.3 GARAGE EXTERIOR PERSONNEL DOOR AND OTHER EXTERIOR DOORS

A garage exterior personnel door if provided as a betterment, and any other exterior doors should match the size and construction quality of front entry doors. Glazed openings are not desirable. No storm door is required.

## 9.17.4 INTERIOR DOORS

Interior doors shall be flush, solid core with stain grade oak face. Provide wood trim at all interior door jambs and heads. Provide either stained and sealed oak, or wood with painted finish.

## 9.17.5 DOOR CLOSERS

Self-closing doors are required on all doors in fire rated walls. Door closers in one hour rated walls shall comply with ASI/BHMA Standard A156.4.

## 9.17.6 DOOR STOPS

Hinge pin-type door stops should be avoided.

## 9.18 CRITERIA FOR BUILDERS HARDWARE

Hinges, locks, and latches will comply with the specifications indicated in Table 9-10, and the following subparagraphs:

TABLE 9-10 – HARDWARE SPECIFICATIONS

Hardware Type/ Specification	Specific Requirements
Hinges BHMA 101  Hinges shall be 4 in x 4 in at exterior doors, and 3-1/2 in x 3-1/2 in at i doors.	
Locks & Latches BHMA 601  Series 4000, Grade 2, at exterior doors. Grade 2 at interior doors. Provide wrought brass, aluminum, or stainless steel.	
Auxiliary Locks BHMA 501	Series 4000, Grade 2. Provide matching trim of wrought brass, aluminum, or stainless steel.
Interconnected Lock & Latches BHMA 611	Grade 2. Provide matching trim of wrought brass, aluminum, or stainless steel.
Closers BHMA 301	Series CO2000, Grade 2.

## 9.18.1 LOCKS AND KEYS

Lock cylinders shall accept seven pin interchangeable cores (manufactured by Best Locks) which are removable by a control key and accommodate a master keying system. The Contractor shall provide construction cores controlled by a master key. Immediately before the acceptance of a unit, the Government will provide seven-pin Best cores for the Contractor to install in the unit. Locks for each housing unit, including garage door(s), shall be keyed alike. Locks and keys shall conform to the standards and requirements of the Builders Hardware Manufacturers Association (BHMA) listed above.

## 9.18.2 WEATHERSTRIPPING AND EXTERIOR THRESHOLDS

Provide vinyl weather-stripping for all housing unit exterior doors. Vinyl magnetic weather-stripping is acceptable for metal doors. Exterior thresholds shall be made of nonferrous metal. Refer to Part 3 for air infiltration criteria.

## 9.18.3 APPLICATIONS

Locks and hinges shall be applied as follows:

- a) Exterior hinged doors shall have 1-1/2 pair of hinges and either a lockset or an auxiliary lock or an interconnected lock and latch.
  - Exterior double patio doors shall have either a lockset or an auxiliary lock or an interconnected lock and latch, and 1-1/2 pair of hinges.
- b) Each windowless entrance door will have a viewer mounted at eye level, per manufacturer's standard.
- c) Garage personnel doors, where provided, shall have 1-1/2 pair of hinges and lockset.
- d) Interior doors shall have 1-1/2 pair of hinges and latchset with BHMA 601, F75 or F76 operations.
- e) Doors in fire-rated walls from housing unit to garage shall have 1-1/2 pair of ball-bearing hinges, lockset, auxiliary lock or interconnected lock and latch and closer.
- f) Doors of all toilet room compartments shall have bathroom privacy locks. Doors of all master bedrooms shall have the same type of privacy lock as provided for toilet room compartment doors.

## 9.19 CRITERIA FOR BUILDING SIGNAGE AND DOOR BELL

Each housing unit with exterior entrance will have a number visible from the vehicular circulation.

#### **9.19.1 SIGNAGE**

Refer to Part 14 for wall mounted light fixture incorporating illuminated house numbers.

#### 9.19.2 **DOOR BELL**

Front and rear entrances of each unit shall be provided with low voltage door chimes with different sound for easy recognition. Provide illuminated push button mounted on exterior wall near latch side of entrance door. Locked storm door shall not block access to doorbell button. Rough-in for a doorbell visual enunciator shall be provided in each accessible unit.

## 9.20 CRITERIA FOR KITCHEN/BATH CABINETS

Cabinets shall be per AWI Standards. The kitchen cabinets being provided for Improve Family Housing project, FY 2002, at Whiteman AFB are Merillat AVIA Series or equal, with residential-trimmed Northport style door and drawer fronts and natural oak trim; these will be considered a desirable feature on this project. Otherwise, cabinets shall be factory manufactured of Custom grade, oak, plain-sliced transparent finished for all exposed parts. Wall cabinets shall have adjustable shelves. Cabinets shall have spring-loaded self-closing hinges, Mepla DS T21 or approved equal, invisible mounting, 110 degree minimum opening. Pulls shall be as specified herein. Four-inch chrome wire pulls are preferred. Wall and base cabinets shall be essentially of the same construction and appearance. All base cabinets shall have an adjustable intermediate shelf located approximately halfway between the bottom and the drawer unit. Provide a full depth heavy duty pull out shelf at the bottom of all base cabinets. The heavy duty pull out shelves shall have lipped edges front and back; the two sides shall be sized to accommodate the drawer hardware. Hinges shall have zero protrusion at locations with pull out shelves. Cabinets and countertops shall have a flame-spread rating that does not exceed 200 when tested in accordance with ASTM E84 and ASTM E162, Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

## 9.20.1 CABINET CONSTRUCTION

Construct cabinets with flush overlay or European framing style. Frame members shall be mortised and tendoned, dove-tailed or doweled, and glued together. Brace the top and bottom corners with hardwood blocks that are glued with water-resistant glue and nailed in place. Wood cabinet materials and dimensions - Materials and minimum dimensions and thickness for cabinet construction materials shall comply with Table 9-11 and requirements below.

#### 9.20.1.1 Lumber Products

a) Softwood lumber: PS 20 custom grade, moisture content 6%.

**b)** Hardwood lumber: PS 58, premium grade.

## 9.20.1.2 Sheet Materials

- a) Hardwood plywood: PS-51 premium grade; core material of particle board, Red Oak rotary cut, grade "A" finished side and grade "3" for back ply material.
- **b)** Wood particle board: composed of wood chips made with waterproof resin binders of 45 pound density sanded faces.
- c) Softwood plywood: PS 1, custom grade, core material of particle board; species of Douglas Fir.

#### TABLE 9-11 - KITCHEN CABINET SPECIFICATIONS

Element Description	Specific Requirements
Frame Members	Per AWI.
Base Cabinet Toe Space	2-1/2 in x 4 in high with 3/16 inch oak face.
Cabinet Bottoms, Backs Ends, & Tops	Melamine finish over 3/4 inch particle board (except 1/4 inch minimum at back). Provide bottoms in kitchen/bath sink cabinets. Brace bottoms with wood members glued in place.
Doors	Oak panel with oak-face trim, 5/8 inch Red Oak plywood, stile and rail; or provide similar to residential trimmed Northport style door with natural oak trim (Merillat AVIA Series).
Drawer Slides/Guides	KV 1284 or approved equal solid stud acetyl roller, captive in one channel member, 100 pound/pair load capacity, side or bottom mounting, white color epoxy-coated cold rolled steel with positive stop. Lift-out disconnect "stay closed design".
Drawers	Conventional dovetail joint used to fasten side to back and front. All joints glued. All drawers and pull out shelves shall be mounted with side mounted slides. Red oak face front; or provide similar to residential trimmed Northport style door with natural oak trim (Merillat AVIA Series).
Drawer Sides and Bottoms	Cabinet liners to be Industrial grade particleboard coated with industrial paper with double smoothing melamine top coat on both sides. Edges to have color matched PVC edge banding. Bottoms 15 in wide shall be spot-

TABLE 9-11 - KITCHEN CABINET SPECIFICATIONS

Element Description	Specific Requirements
	glued and set into members in grooves 1/4 inch deep with minimum 3/8 inch standing shoulder, fastened with glue blocks, except that at backs, it shall be glued and nailed to bottom edge at back.
Bumper Pads	Cork.
Shelves	3/4 inch industrial grade particle board coated with industrial paper with double smoothing melamine top coat on both sides. Steel supports of flush mounted angle with 1/4 inch diameter by 3/8 inch long on 2 in centers. Shelf edges exposed to view shall be red oak, rounded, filled, sanded, and finished.

#### 9.20.2 COUNTERTOPS

Upgrading to solid surfacing countertops with integral double sink and integral backsplash is considered a "betterment" for the kitchen. Solid surfacing shall be similar to Corian by Dupont or Swanstone by Swan Corporation.

## 9.20.2.1 Kitchen and Laundry

Countertops finish shall be high pressure laminated plastic 0.048-inch thick with an integral backsplash, and shall be applied with heat-resistive adhesive. Minimum backsplash height is 4 inches. Backsplashes shall be provided at both back of counters and at side of counters where abutting a wall. The substrate for countertops shall be 3/4-inch thick particle board. Countertops shall have a no drip front edge.

## **9.20.2.2 Bathrooms**

Lavatory vanity cabinets shall be 34 inches high (standard) with drawers and cabinet drawers below, appropriate to the size of the unit (but with at least one drawer, at least one cabinet door and at least one shelf in the cabinet). Countertops shall be man made cultured marble, 30 inches deep (minimum) with seamless backsplash, of 4 inch maximum height provided both at back of counters and at sides where abutting a wall. Countertops shall have a no drip front edge. Refer to Part 11 for information on lavatory bowl integral with countertop.

## 9.21 CRITERIA FOR ACCESSORY ITEMS

#### 9.21.1 PRIVACY SCREENING AT DUPLEX

Provide backyard privacy screening from adjacent housing units in all duplex configurations. Screening shall be attached to the building. It shall be 6-foot high and extend out from the nearest wall of the building far enough so that no corner of the patio in one unit of the duplex is visible from any corner of the patio in the other unit of the duplex. Screens shall permit air flow while maintaining visual privacy. Construction should match or compliment adjacent exterior wall surface or fencing. Refer to Part 4 for fencing requirements.

## 9.21.2 BUILDING ENVELOPE TIGHTNESS TESTING

Refer to the requirements in Part 3 for building envelope tightness testing.

## 9.21.3 ACCESS TO CRAWL SPACE

Provide a crawl space access door. The floor of an interior closet is an acceptable location, but the preferred location is the floor of the mechanical room. Size of door shall be minimum 32 inches in each direction. When adjacent floor is finished, finish of access door shall match finish of adjacent floor.

## 9.22 HOUSING UNIT DESIGN CHECKLIST

- □ For each different unit to be provided, submit documentation in accordance with Section 00110, "Tab 7 Housing Unit Concept Design Submittal Requirements".
- □ For each different unit to be provided, list each betterment included. Refer to Section 00110, "Tab 7 Housing Unit Concept Design Submittal Requirements" for additional submittal information.
- ☐ For each different unit to be provided, also submit floor plans indicating assumed typical furniture layouts, including porch and patio furniture layouts. On these furniture plans, indicate all door swings and window locations.

# PART 10 - HOUSING UNIT STRUCTURAL DESIGN

# **INDEX**

10	HOUSING UNIT STRUCTURAL DESIGN	2
10.1	SECTION SUMMARY	2
10.2	References	
10.3	SEISMIC DESIGN	2
10.4	Design	
10	.4.1 General	3
10	.4.2 Dead Loads	
10	.4.3 Roof Live Loads	
10	.4.4 Floor Live Loads	
10	.4.5 Wind Loads	
10	.4.6 Lateral Resistance	
10.5		
10	.5.1 Reinforced Concrete	
	.5.2 Steel	
10	.5.3 Wood	
	10.5.3.1 General	
	10.5.3.2 Exterior Wood Structural Members	4
	10.5.3.3 Plumbing Walls	
	10.5.3.4 Sheathing	
	10.5.3.5 Roof Sheathing	
	10.5.3.6 Sub-Floors	
	10.5.3.7 Structural Sheathing or Exterior Concealed Panels	
	10.5.3.8 Wood Trusses	
	10.5.3.10 Wood Flooring System	
10.6	CONSTRUCTION	
	.6.1 Concrete Design	
10	10.6.1.1 General	
	10.6.1.2 Forms	
	10.6.1.3 Reinforcing Materials	
	10.6.1.4 Concrete Materials	6
	10.6.1.5 Curing Compound	6
	10.6.1.6 Ready-Mix Concrete	
	.6.2 Footings	
	.6.3 Foundation Walls	
	.6.4 Crawl Space	
	.6.5 Slabs-On -Grade	
	.6.6 Superstructure	
10.7	HOUSING UNIT STRUCTURAL DESIGN CHECKLIST	Q

# 10 HOUSING UNIT STRUCTURAL DESIGN

## 10.1 SECTION SUMMARY

This section addresses structural housing unit design requirements (Design Conditions, Foundations and Slabs-On-Grade, and Superstructure).

## 10.2 REFERENCES

Departments of the Army and the Air Force - TM5-809-1/AFM 88-3, Chap. 1 - Structural Design Criteria Loads

Departments of the Army, Navy, and the Air Force – TM5-809-10/NAVFAC P-355/AFM 88-3, Chap. 13 – Seismic Design for Buildings

International Code Council

IBC International Building Code (most recent edition)
IRC International Residential Code (most recent edition)

Federal Manufactured Housing Construction and Safety Act (FMHCSS)

The following Government-provided Specification Sections, included in this RFP, that contain building and site requirements relating to foundations, slabs-on-grade, and superstructure:

Section 02230 EARTHWORK

Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS

Section 02316 EXCAVATION, FILLING AND BACKFILLING FOR UTILITIES SYSTEMS

Section 02620 SUBDRAINAGE SYSTEM

Section 02700 ASPHALTIC CONCRETE (CENTRAL PLANT HOT MIX)

Section 02712 LIME-MODIFIED SUBGRADE

Section 02714 RAPID DRAINAGE LAYER

Section 02721 SUBBACE COURSES

Section 02722 CRUSHED BASE COURSE

Section 02748 BITUMINOUS TACK AND PRIME COAT

Section 02760 FIELD MOLDED SEALANTS IN RIGID PAVEMENTS

Section 02763 PAVEMENT MARKINGS

Section 02770 CONCRETE SIDEWALKS

Section 03100 STRUCTURAL CONCRETE FORMWORK

Section 03150 EXPANSION JOINTS AND WATERSTOPS

Section 03200 CONCRETE REINFORCEMENT

Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE

Section 03350 NON-METALLIC SURFACE-HARDENED CONCRETE FLOOR

## 10.3 SEISMIC DESIGN

Seismic design shall be performed in accordance with the requirements of TM 5-809-10/NAVFAC P-355/AFM 88-3, Chap. 13 which is available on the internet at the following web address (URL) [http://www.hnd.usace.army.mil/techinfo] and the USGS Ground Motion maps referenced therein are available at [http://www.geohazards.cr.usgs.gov/eq/]. The design criteria is as follows:

• Seismic Zone (per TM):

Seismic Design Category (per IRC): ASite Class (per IRC): D

## 10.4 DESIGN

#### **10.4.1 GENERAL**

Structural design and construction shall be in accordance with the requirements stated herein. Structural design shall be accomplished by a registered structural engineer. The overall structural system shall be selected based on durability, maintainability, and cost-effectiveness. Panelized or modular systems that comply with FMHCSS are acceptable. The lateral support system shall be selected from conventional industry standard systems and shall be compatible with the vertical load carrying system. The design drawings shall contain in the General Notes a list of the design loading criteria, a list of the strengths of the engineering materials used, the design soil values and any other data that would be pertinent to remodeling and/or future additions. Structural calculations to substantiate the structural design shall be submitted in accordance with the requirements of Section 1332 SUBMITTALS DURING DESIGN.

#### 10.4.2 DEAD LOADS

The structural system shall be designed and constructed to safely support all dead loads, permanent or temporary, including self weight, partitions, insulation, ceiling, floor covering, and all equipment that is fixed in position.

## 10.4.3 ROOF LIVE LOADS

Roofs shall be designed to support live loads, including snow, snow drifting and unbalanced snow loads, in accordance with applicable sections of IRC using the following criteria:

Minimum Roof Live Load	20 psf
Ground Snow Load	20 psf

#### 10.4.4 FLOOR LIVE LOADS

Floors shall be designed to support live loads in accordance with IRC.

#### 10.4.5 WIND LOADS

The structural framing and anchorages for exterior cladding and windows shall be designed to resist wind loads calculated and applied in accordance with the IRC. Wind loads shall be calculated using the following wind speed parameters:

Basic Wind Speed	80 mph
------------------	--------

Exposure	В	

## 10.4.6 LATERAL RESISTANCE

Walls, when used or required for lateral resistance to wind or earthquake, shall be considered bearing walls and shall have full foundations. Allowable variations from level, or specified slopes, shall be as follows:

For overall length, or surface of 10' or less, plus or minus 1/8". Up to 20', plus or minus 1/4". Up to 40', plus or minus 3/8".

## 10.5 MATERIALS

## 10.5.1 REINFORCED CONCRETE

Reinforced concrete shall conform to the Government-provided specification section included in the RFP, to the requirements of IBC, and to the following:

- a) The minimum required 28-day compressive strength of the concrete shall be 4,000 psi. For concrete that is to be installed with exterior exposure, air-entrainment, producing a total air content in the concrete between 4 and 7 percent by volume, shall be required.
- **b**) Reinforcement for temperature and shrinkage shall be required.

## 10.5.2 STEEL

Structural steel and cold-formed steel structural members shall conform to the requirements of IBC and IRC.

## 10.5.3 WOOD

Wood shall conform to the requirements of IRC and the following:

## 10.5.3.1 General

Structural wood design shall comply with the International Residential Code (IRC), except as noted herein. The detailing of structural wood framing, including connections shall be complete. All metal connectors, bolting layouts, bolt sizes, screwing patterns, screw sizes, nailing patterns and nail sizes shall be shown in details and calculations. All members that are a part of the main vertical and/or lateral force resisting system must be completely detailed.

## 10.5.3.2 Exterior Wood Structural Members

In general, exposed wood structural members and railing are not desirable. Exterior wood structural members that are exposed to view, such as columns, beams, stair stringers, (minimum 4 – inch normal thickness) and railings shall be of lumber that is graded for appearance and pressure treated for decay

resistance. Heel plates and all wood in contact with soil and concrete shall be pressure treated for termites. Wood that can come in physical contact with people such as decking and railing shall not contain arsenic-based preservatives. Refer also to Part 3 for sustainability criteria.

#### 10.5.3.3 Plumbing Walls

Place plumbing in walls with a nominal 6 inch stud cavity.

#### **10.5.3.4 Sheathing**

No particleboard or fiber board is to be used in structural applications, including roof sheathing, subfloors, and structural sheathing or exterior concealed panels. The sheathing used shall have adequate and appropriate span rating per the American Plywood Association (APA) (design specifications and construction guide) for the application and conditions proposed and shown on the contract drawings.

## 10.5.3.5 Roof Sheathing

APA Rated Sheathing or Structural 1 or 2 Rated Sheathing, Exposure 1. Roof sheathing must be either tongue and groove or use "H" clips between rafters and top of chord trusses. Plywood, waferboard, oriented-strand board, or comply panels may be used. All roof sheathing laid shall be covered with felt be the end of each day or when storm is approaching. Roof sheathing damaged due to moisture shall be replaced.

#### 10.5.3.6 **Sub-Floors**

Sub-floors shall be protected from the elements of weather at all times during construction. Any panels damaged from water or other means shall be replaced.

#### 10.5.3.7 Structural Sheathing or Exterior Concealed Panels

APA STRUCTURAL 2 RATED SHEATHING: Exposure 1 shall be 15/32 – inch minimum thickness; if engineered, smaller thickness will be acceptable. Square edges, solid blocking required under all edges.

#### 10.5.3.8 Wood Trusses

Wood trusses shall be designed for the loads indicated. The design of trusses shall be integrated into the vertical and lateral load carrying systems. Truss connection plates shall be sized for axial loads of members, eccentricity, and net section of metal. A minimum plate size of 15 square inches shall be required. Truss connections shall allow for full thickness ceiling insulation all the way to the exterior wall sheathing. Refer to Part 3 for insulation criteria. A registered structural engineer must compute loads on the roof trusses and submit signed and sealed calculations for approval.

#### 10.5.3.9 Joists and Beams

Joists and beams fabricated with laminated veneer lumber may be used. Products must have National Research Board (NER) and HUD approvals.

## 10.5.3.10 Wood Flooring System

Wood flooring system shall be glued and nailed. Glue line shall not be considered for stress transfer in diaphragms. Wood flooring system shall be glued and nailed on accordance with the American Plywood Association recommendations and guidelines for the installation of glued floor systems.

## 10.5.3.11 Structural Building Panels

In lieu of conventional stick-built structures, insulated structural panels may be used. As a guide, roof panels shall be 7/16 inch OSB (oriented strand board) laminated to both sides of a core of AFM Certified EPS rigid insulation. Exterior wall panels are similar, except that the insulating core should be 7-1/4 inch minimum. Refer also to Part 3. Provider, may, at his option, use any combination of insulated panels and conventional stick framing for the roof, exterior walls and floor construction.

## 10.6 CONSTRUCTION

#### 10.6.1 CONCRETE DESIGN

#### 10.6.1.1 General

All foundation walls and footings shall be constructed of reinforced cast-in-place concrete. Do not use keys in horizontal and vertical concrete construction joints. Rake construction joints to roughen to 1/4" amplitude.

#### 10.6.1.2 Forms

Plywood, metal, metal-framed, aluminum, reinforced fiberglass, or plywood-faced, to provide continuous, straight, smooth, exposed surfaces. Limit deflection to 0.0025 of the span.

## 10.6.1.3 Reinforcing Materials

Reinforcing Bars: ASTM A615, Grade 60, deformed. Welded Wire Fabric: 6 x 6 – WI.4 x W1.4, ASTM A185 or ASTM A497, flat sheets only.

## 10.6.1.4 Concrete Materials

Cement: ANSI ASTM C150, type I gray Portland cement.

Fine Aggregate: ASTM C33 and C40. Coarse Aggregate: ASTM C33 and C40. Air-Entraining Admixture: ASTM C260. Calcium Chloride will not be permitted.

Fly Ash: ANSI/ASTM C618, Class "C"; fly ash content shall not exceed 20 percent of cement content or

100 pounds of fly ash per cubic yard of concrete, whichever is less.

## 10.6.1.5 Curing Compound

Liquid type membrane-forming curing compound complying with ANSI/ASTM C309, Type I, Class A. Concrete curing compounds shall be limited to 350 9/1 of volatile organic compounds in accordance with SCAQMD Rule 1113.

## 10.6.1.6 Ready-Mix Concrete

Provide in conformance to ASTM C94.

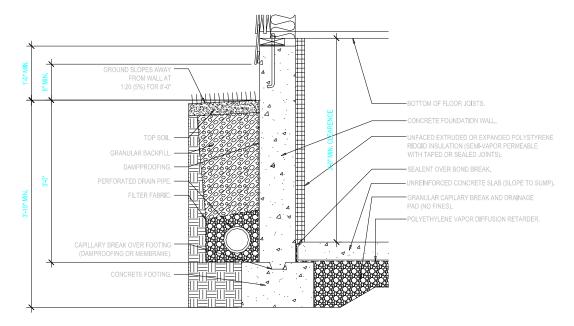
## **10.6.2 FOOTINGS**

Footings shall be constructed of reinforced concrete and extend below the frost line. The minimum footing depth shall be 46 inches. Excavations shall be prepared in accordance with the Geotechnical Survey Report (see Attachments to the RFP). All units shall be constructed over a crawl space. If constructed over a combination of a basement and a crawl space, footings and structure shall be designed and constructed such that changing soil conditions will not permit structural walls and floors to sag, buckle or heave. Slab-ongrade is permissible only for garage and patio.

## 10.6.3 FOUNDATION WALLS

- a) Foundation wall shall be constructed of reinforced concrete.
- **b)** Foundations walls shall extend at least 6 inches above finish grade.
- c) Foundation walls supporting crawl space shall have a foundation drainage system installed around the foundation perimeter in accordance with IRC. Foundation drainage system shall either be directly connected to the storm sewer or daylighted at least 20 feet behind rearmost wall of the unit and outside any fenced rear yard.
- **d**) Refer to Figure 10.6.3 and to Part 3 "Sustainable Design and Construction Criteria" for additional clarification.

**Figure 10.6.3** 



#### 10.6.4 CRAWL SPACE

Crawl space shall have a non-reinforced concrete "mud slab" sloped to a concrete sump, which may also be used with the passive radon system as described in Part 11. Access is from the interior of the unit only. Provide one duplex power outlet inside the crawl space convenient to the access door. Also refer to Figure 10-6.3. Always maintain minimum 3 foot clearance below floor joists and minimum 2 foot clearance below lowest floor support member.

#### 10.6.5 SLABS-ON-GRADE

- a) Concrete slabs-on-grade shall be not be less than 5 inches and designed as "floating slabs" without rigid edge support. Bond breaker, such as building felt, shall be used between slab edges and abutting vertical surfaces.
- b) Slabs shall be damproofed in accordance with the performance requirements in Part 3.
- c) Slabs reinforcement shall be placed 1-1/2" from top of slab.
- d) Crack control measures shall be incorporated into slab construction. Distance between crack control joints should typically not exceed 15 feet or 400 sq. feet. All slab crack control joints, joints between edges of slabs and vertical surfaces, and any mechanical, plumbing or electrical penetrations through the floor slab shall be sealed with a flowable polyurethane caulk. Garage slabs shall be given a steel troweled finish.

## 10.6.6 SUPERSTRUCTURE

The superstructure shall be framed with wood, structural steel, cold-formed steel structural members, or combinations thereof. Panelized or modular systems constructed offsite shall be allowed.

# 10.7 HOUSING UNIT STRUCTURAL DESIGN CHECKLIST

□ For each different unit to be provided, submit documentation in accordance with Section 00110, "Tab 7 Housing Unit Concept Design – Submittal Requirements".

# PART 11 - UNIT DESIGN – PLUMBING

# **INDEX**

11 UNIT DESIGN - PLUMBING	2
11.1 General	2
11.2 Water Piping	2
11.2.1 Copper Tubing	2
11.2.2 Crosslinked Polyethylene (PEX) Tubing	2
11.3 SOIL, WASTE, VENT, AND DRAIN PIPING	
11.3.1 Water Test	3
11.4 GAS CONNECTIONS	3
11.4.1 Gas Piping	3
11.4.2 Gas Testing	3
11.4.3 Gas Purging	3
11.5 PLUMBING FIXTURES	4
11.6 WATER CLOSETS	
11.7 LAVATORIES	
11.8 Bathtubs	
11.9 KITCHEN SINKS	
11.10 Other Sinks	
11.10.1 Future Utility Sink	
11.10.2 Optional Laundry Sink	
11.11 CLOTHES WASHER CONNECTIONS	
11.12 HOSE BIBBS	
11.13 PIPING LOCATIONS	
11.14 CLEANOUTS	
11.15 WATER HEATER	
11.15.1 Gas-Fired Water Heaters	
11.16 SHOCK ABSORBERS	
11.17 MISCELLANEOUS PIPING	
11.18 FLOOR DRAINS	
11.19 FLUSHING	
11.20 DISINFECTION	
11.21 RADON PREVENTION AND TESTING	
11.22 Unit Design – Plumbing Checklist	8

## 11 UNIT DESIGN - PLUMBING

## 11.1 GENERAL

The plumbing system shall conform with the requirements of the Air Force Family Housing Guide (paragraph 4.10.2); with the International Plumbing Code, latest edition, governing backventing of plumbing fixtures, sizing of waste, vents, drains, backflow prevention and water systems; and with the requirements provided herein. All water supply piping shall be rigid copper and Crosslinked Polyethylene (PEX) tubing. Locate the water service main cutoff valve (ball valve with a drain) in the mechanical room. Waste water line vents shall be tied together with a single vent extending through the roof. Refer also to Part 3 for energy performance and conservation requirements.

## 11.2 WATER PIPING

Under slab supply piping shall be limited to housing unit service entrance only. Service line to each housing unit shall be as indicated in Part 8 under "Water Distribution". New lines shall be installed below the recognized frost line. All water supply piping shall be sized in accordance with methods outlined in International Residential Code (IRC), to limit water velocity in the pipe to 8 ft/sec unless a lower velocity is recommended by the plumbing fixture manufacturer(s). An isometric diagram of the water system shall be included in the 100% design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN). Allowable pipe materials are listed below.

#### 11.2.1 COPPER TUBING

Water piping under concrete slabs shall be copper tubing, type K, annealed. Joints under slabs are not allowed. Interior water piping shall be type L hard-drawn copper. Fittings for soft copper tubing shall conform to ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes, and for hard-drawn to ANSI B16.22, Wrought Copper and Copper alloy Solder Joint Pressure Fittings. Underslab supply piping shall be limited to unit service entrance only. Upon completion of rough-in operation and prior to concealing in the structure and the setting of plumbing fixtures, the entire hot and cold water piping systems shall be tested at a hydrostatic pressure of not less than 100 pounds per square inch gage, and proved tight at this pressure for 2 hours. Where a portion of the water piping system is to be concealed before completion, such portion shall be tested separately in the same manner as specified for the entire system.

## 11.2.2 CROSSLINKED POLYETHYLENE (PEX) TUBING

Within walls and floor joist cavities, use crosslinked polyethylene (PEX) tubing, in accordance with the requirements of the IRC.

## 11.3 SOIL, WASTE, VENT, AND DRAIN PIPING

Except as noted below, soil, waste, vent, and drain piping shall be polyvinyl chloride (PVC), or plastic suitable for installation in a residential waste, soil, vent, and drain system, except that lateral water lines into the family units and condensate lines shall be copper. Each fixture and piece of equipment, except water closets, requiring connection to the drainage system, shall be provided with a trap. Provide deep seal trapped drain with air gap for cooling coil condensate drain. Soil, waste, and drain piping installed below floor slabs shall be service weight hub and spigot cast iron, plastic pipe suitable for installation in a residential waste, soil, vent, and drain system, or Acrylonitrile-Butadiene-Styrene (ABS). Building waste main lines shall be 4-inch diameter. All soil, waste, and drain piping shall be sized in accordance with the

methods outlined in the International Plumbing Code. Provide an approved double wye cleanout immediately outside of the building's main waste line. Plumbing vents shall not vent into attic but, penetrate roof and extend above the roof per code. Locate vents on the backside slope of the roof so as not to be visible from the front of the housing unit. On straight runs of pipe, cleanouts shall be provided at not more than 50 feet apart. Cleanouts shall be provided at each change of direction of pipe and shall be provided at the base of all soil, waste, and vent stacks. All unfinished plumbing work, such as cleanouts, fittings, etc, exposed to finished rooms or spaces shall be concealed by an escutcheon plate or similar finished device. Soil, waste, and drain piping shall be tested with water or air before fixtures are installed. After the plumbing fixtures have been set and the traps filled with water, the drain and waste lines shall be submitted to a visual test for leakage. An isometric diagram of the sanitary sewer system shall be included in the 100% design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN).

#### 11.3.1 WATER TEST

Water test shall be applied to the soil, waste, and drain system either in the entire system or in sections. If the test is applied to the entire system, all openings in the piping shall be tightly closed except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening except the highest opening of the section under test shall be tightly plugged, and each section shall be filled with water and tested with at least a 10 feet head of water. In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested so that each joint or pipe in the building. Except the uppermost 10 feet of the system, has been submitted to a test of at least 10 feet of head of water. Water shall be kept in the system or portion under test, for at least 15 minutes before inspection starts; the system shall then be tight at all joints.

## 11.4 GAS CONNECTIONS

The use of semirigid tubing and flexible connectors for gas equipment and appliances is prohibited. Except that the final connections to the kitchen ranges shall be made using flexible connectors conforming to ANSI Z21.45, Flexible Connectors of Other Than All Metal Construction for Gas Appliances, not less than 40 inches long. Interior pipe shall be steel, Schedule 40; black, as specified in ASME B31.8. Provide accessible gas shutoff valve and coupling for each gas equipment item. Comply with IBC, IRC & IPC requirements. Exposed horizontal piping shall not be installed farther than 6 inches from the nearest parallel wall in laundry areas or areas where clothes hanging could be attempted. Provide a 1/2 inch stubout for possible (occupant-owned automatic gas clothes dryer), gas range and gas oven.

## 11.4.1 GAS PIPING

The interior gas piping, from the low-pressure regulator to the equipment, shall be wrought iron or steel, and the fittings, shall be malleable iron conforming to ANSI B36.10. The complete piping installation shall conform to all aspects of NFPA 54, except as stated in paragraph "Gas Connections".

## 11.4.2 GAS TESTING

The Contractor shall set up in an accessible position, where directed, a test pump and a mercury gauge connected to the permanent gas piping. Pump and gauge shall be properly protected and kept in working order until after final inspection. All gas piping shall be subjected to an air test of 15-inch mercury column pressure without drop for 15 minutes. Gas piping shall be tested with air only. Tests shall be made by and at the expense of the Contractor and at such time as directed, and in the presence of the authorized Government representative. If there is any reduction in pressure during test period, test isolated sections and joints with soapsuds and replace leaking joints and reapply test.

#### 11.4.3 GAS PURGING

After testing is completed, and before connecting any appliances, all gas piping shall be fully purged. Piping shall not be purged into the combustion chamber of an appliance. The open end of piping systems being purged shall not discharge into confined spaces or areas where there are ignition sources unless the safety precautions recommended in NFPA 54 are followed.

## 11.5 PLUMBING FIXTURES

Residential type fixtures and trim shall be provided and shall comply with ANSI Standards. Fixtures shall be provided complete with fittings, and chromium-plated or nickel-plated brass (polished bright or satin surface) trim. All fixtures, fittings, and trim in the project shall be from the same manufacturer and shall have the same finish. Faucets may be from a different manufacturer as the fixtures, fittings, and trim; however, all faucets shall be from the same manufacturer for each of the new family housing units. Metal escutcheons plates shall be installed at all water supply and drainpipe connections through walls or cabinets.

Plumbing shall meet the following criteria. Refer to Part 3 for additional clarification.

- a) Exposed traps shall be chromium-plated, adjustable-bent tube, 20-gauge brass. Concealed traps may be plastic (ABS).
- b) Faucets shall be single-control type, with seals and seats combined in one replaceable cartridge designed to be interchangeable among lavatories, bathtubs and kitchen sinks, or having replaceable seals and seats removable either as a seat insert or as a part of a replaceable valve unit. Water flow shall be no more than 2.5 gpm from any faucet.
- c) Shower and bath combination shall be controlled by a diverter valve, and shall be provided with a chrome plated brass curtain rod and chrome plated brass flanges. Baths and shower and bath combinations shall be provided with waste fitting pop-up, concealed with all parts removable and renewable through the overflow and outlet openings in the tub with access panels. Shower and bath combinations shall be equipped with a combination valve and flow control device to limit the flow to 2.5 gpm at pressure between 20 to 60 psi.
- d) Piping shall be concealed. Individual shut off valves on water supply lines to each individual sink, lavatory, water closet, water heater, and dishwasher shall be provided immediately below or adjacent to the fixture. Individual shutoff valves concealed behind access panels shall be provided on water supply lines to all other plumbing fixtures including bathtubs and showers. In multi-story units, providing separate shutoff valves for each floor is a desirable feature.
- e) Fixtures shall be water conservation type.
- f) Vitreous china plumbing fixtures shall conform to ANSI A112.19.2, Vitreous China Plumbing Fixtures. Stainless steel fixtures shall be in accordance with ANSI A112.19.3, Stainless Steel Plumbing Fixtures (residential design). Enameled cast iron plumbing fixtures shall comply with ANSI A112.19.1, and enameled steel fixtures shall comply with ANSI A112.19.4.

## 11.6 WATER CLOSETS

Water closets shall be one-piece toilets, with bowl and tank integrated. Provide an elongated bowl, close coupled siphon jet, floor outlet with wax gasket, closed-front seat and cover, and an anti-siphon float valve. Water consumption shall be no more than 1.6 gal per complete flush cycle. Also refer to sustainability criteria in Part 3. Water closet shall be vitreous china and trim shall conform to ANSI A112.19.5, Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards).

## 11.7 LAVATORIES

Lavatories shall be man-made cultured marble integral with the cabinet-mounted countertop. Bowl size shall be a nominal 13" x 16" x 5-1/2", with overflow.

## 11.8 BATHTUBS & SHOWERS

Bathtubs shall be slip resistant and shall be constructed of porcelain steel. Showers shall have fiberglass shower pan, metal and glass shower door, and chrome-plated drain cover. Bathtubs and showers shall have hard-seamed solid surfacing walls to a height of at least 6 feet above finish floor. One-piece tub/shower/wainscot units are prohibited.

## 11.9 KITCHEN SINKS

Kitchen sinks shall be Type 302 stainless steel, 20-gauge minimum, seamless drawn, and sound deadened. Sinks shall be double bowl (each a minimum of 8" deep), self-mounting without mounting rings, complete with cup strainer and plug. Preferred minimum size of large bowl is 22 x 33 inches. Refer to Part 12 for Food waste disposers. Strainer and plug shall be eliminated where food waste disposers are provided. Provide a cleanout trap a minimum of 4 inches above the floor. If solid surfacing kitchen countertops are provided as a "betterment", sinks shall be integral with counter tops with similar dimensions and accessories as described above.

## 11.10 OTHER SINKS

#### 11.10.1 UTILITY SINK

Furnish and install floor-mounted heavy-duty plastic utility sink in garage, including hot and cold water and sanitary line. Minimum basin size is 18" x 18" x 12" deep. Refer to Part 9 for additional information on location.

## 11.10.2 LAUNDRY SINK AS A BETTERMENT

If provided, laundry sink shall be stainless steel, rimless, nominal 8" depth, approx. 16" by 14", with overflow. Provide a cleanout trap a minimum of 4 inches above the floor. Refer to Part 9 for criteria regarding laundry sink cabinetry.

## 11.11 CLOTHES WASHER CONNECTIONS

Drainage and hot and cold water supply shall be provided for occupant-provided automatic clothes washers. Washer connection, complete with 2-inch drain, with mouth 3 feet above the floor, 3/4-inch hose thread supplies shall be provided in standard manufactured recessed wall box with single-face plate. Boxes shall be constructed of plastic. Boxes shall be mounted a minimum of 2 ft-10 inches above the finish floor. Electrical outlets for both washer and dryer shall also be provided but can be located separate from the washer connection box. Finish color shall be painted to match adjacent finishes. In addition, provide a standard gas dryer connection with concealed piping.

## 11.12 HOSE BIBBS

Hose bibbs (wall hydrants) shall be provided at the front and rear of each housing unit. Hose bibbs shall be anti-siphon, automatic draining type non-freeze, frostproof, and shall be supplied with an integral backflow preventer/vacuum breaker as well as shutoff valve.

## 11.13 PIPING LOCATIONS

Water piping shall be installed on the warm side of insulation and shall be wrapped with insulation and a vapor barrier jacket. Determination of the warm side shall be the same as determined for vapor barrier location. Water piping shall be run in crawl spaces or below floors of upper stories, but not in attics. Water piping runs in exterior walls shall be avoided except for hose bibbs. Interior piping shall be accessible for future maintenance.

## 11.14 CLEANOUTS

Accessible cleanouts shall be provided at each change in direction of sanitary sewer lines, at the intervals specified in the International Plumbing Code, and at the building service entrance. All cleanouts shall be permanently accessible. Ground cleanouts shall be located in the front yard flush with grade, and shall be 2-way operational.

## 11.15 WATER HEATER

Water heaters shall be located in the main floor mechanical room. Water heaters shall have round; glass lined tanks, shall have earthquake straps, and shall be installed with an integral insulating wrap with a minimum R-value of 8.3 (refer also to Part 3). Access shall be provided in the wrap for service and maintenance openings. Storage water heaters that are not equipped with integral heat traps and having vertical pipe risers shall be installed with heat traps directly on both the inlet and outlet. Circulating systems need not have heat traps installed. The water heater relief drain shall be manufacturer approved, and shall be indirectly connected to the building sanitary sewer system. Water heaters shall be gas-fired 40 gallons with electronic pilotless ignition. Water heater energy factors shall meet or exceed the minimum requirements of 10 CFR 430 and the requirements of Part 3. Water heaters shall have factory-preset thermostats to limit water temperature to 120 degrees F maximum.

Water heaters shall be installed in a water heater pan, similar to Oatey 34000 series plastic, with fitting piped to the exterior of the unit. Provide a rodent and insect screen at the exterior terminus.

## 11.15.1 GAS-FIRED WATER HEATERS

Gas fired water heaters shall be in accordance with ANSI Z21.10.1, Water Heaters, Gas, Volume I, Storage Type, 75,000 BTUH Input or less, ASHRAE 90A, NAAECA 1990 and certified by American Gas Association. Working pressure shall be 150 psig with a factory test of 300 psig. A pressure/temperature relief valve and drain shall also be provided. Water heaters with powered ventilation shall be vented in accordance with manufacturer's instructions. Flue shall not be oversized. Flue when run through attic shall penetrate roof and extend above the roof with weatherproof installation per code. Flue shall be routed out through the roof and be located on the backside of the roof so as not to be visible from the front of the housing unit. Double-wall UL-listed chimney shall be provided. Ducted combustion air shall be provided. Refer also to Part 3 for energy performance requirements.

## 11.16 SHOCK ABSORBERS

Shock absorber units, to control water hammer, are required at clothes washer and dishwasher supplies; supplied and installed in accordance with the manufacturer's recommendations. Air chambers are unacceptable. Access panels shall be provided.

## 11.17 MISCELLANEOUS PIPING

Cold water piping for the icemaker shall be installed behind the refrigerator with an angle valve in a semirecessed plastic box.

#### 11.18 FLOOR DRAINS

In addition to the standard washing machine drain, provide a floor level drain inlet in case the washing machine overflows. Provide a tile drain sump pump if the mechanical room is in a basement. Such a tile drain sump pump shall drain to the sanitary sewer system.

## 11.19 FLUSHING OF POTABLE WATER SYSTEM

After pressure testing and before disinfection, potable water piping systems shall be flushed with potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 feet per second through all portions of the piping system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by NSF 61, section 9, shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period. Removal of the aerator portion of the faucets shall be done to prevent clogging. Refer also to Part 3 for sustainability requirements.

## 11.20 DISINFECTION OF POTABLE WATER SYSTEM

After system flushing is complete, the entire domestic hot -water and cold-water distribution system shall be disinfected with chlorinating material consisting of Sodium or Calcium Hypochlorites. Completely drain the system and fill with a solution of Sodium or Calcium Hypochlorite at 100 parts per million and completely relieve the system of air. Allow the solution to stand for eight (8) hours and then drain and follow with a clear flush for a sufficient period of time to remove all traces of hypochlorite odor. Refer also to Part 3 for sustainability criteria.

## 11.21 RADON PREVENTION AND TESTING

The housing units shall be constructed to include a passive system for control of radon in the structure. Refer also to Part 3 for sustainability requirements. This system shall be constructed in accordance with U.S. Army Corps of Engineers Technical Instructions, Indoor Radon Prevention and Mitigation (TI 810-91, 3 August 1998). Provide a sub-slab depressurization system with a natural draft using 3-inch PVC vent (suction) piping installed vertically to remove radon gases before they enter the building. Multiple runs may be provided and connected to one common stack through the roof. Radon vent pipe is to be routed through attics in a location that will facilitate future installation and maintenance of a fan. The pipe can be embedded into the aggregate through the slab. The standpipe shall be extended vertically through the building floors. Terminating at least 12 inches above the surface of the roof at a location that is at least 10 feet away from any window or other opening into the conditioned spaces of the building that is less than 2 feet below the exhaust point, and at least 10 feet from any adjoining or adjacent buildings. A rainproof installation above the roof shall be provided. A length of 3-inch diameter perforated pipe shall be installed horizontally beneath the sheeting and connected to a 3-inch "T" fitting with a vertical standpipe installed through the sheeting, serving each 1500 square feet of slab area. Rough in shall be provided for electrical wiring to facilitate future installation of a fan and system failure-warning device. After the building envelope is complete, and with all HVAC systems operating on normal cycles, the Government may elect to test the facility for radon levels. An in-line fan (and system failure warning device) may be installed through a future contract if the building fails tests and requires an active system. Note: If the sump is to be used as the suction point in an active sub-slab depressurization system, the lid should be designed to accommodate the vent pipe. If also intended as a floor drain, the lid shall also be equipped with a trapped inlet to handle any surface water on the slab.

# 11.22 UNIT DESIGN – PLUMBING CHECKLIST

□ For each different unit provided, submit documentation in accordance with Section 00110, "Tab 7 Housing Unit Concept Design – Submittal Requirements".

# PART 12 - MAJOR APPLIANCES

# **INDEX**

12	MAJOR APPLIANCES	2
12.1	General	2
12.1		
	FREEZER	
12.4	DISHWASHERS	2
	GARBAGE DISPOSALS	
	6 RANGES AND OVENS	
	2.6.1 Range Hoods	
	MICROWAVE OVENS	
12.8	DOOR OPENER	
12.9	MAIOR APPLIANCES CHECKLIST	3

## 12 MAJOR APPLIANCES

## 12.1 GENERAL

The Contractor shall furnish major appliances in accordance with the Air Force Family Housing Guide and the following. Color of kitchen appliances, except disposals, shall be of matching finish, white in color. Appliance electrical requirements are provided in Part 14 under Electrical Equipment Requirements.

## 12.2 REFRIGERATORS

Comply with UL 250, Household Refrigerators and Freezers, and shall bear the EPA "Energy Star" certified label. Refer to Part 3 for additional information. Provide refrigerator with two doors with frost-proof top freezer, automatic defrosting, and icemaker. Refrigerator shall have two vegetable bottom baskets, at least four adjustable shelves, at least two shelves and egg container in door; freezer compartment shall contain separate interior shelves, multiple door shelves, and icemaker. Provide reversible (left swing and right swing interchangeable) doors. Refrigerators shall conform to the energy compliance standards of 10 CFR 430. Minimum refrigerator volume is 20.5-21.4 cu ft (GSA size I). Preferred refrigerator has features equal to Model GTS22KCMWW by General Electric (21.7 Cu. Ft. Top-Freezer Refrigerator with Icemaker).

## 12.3 FREEZER

Provide space and electrical hook-ups for tenant-furnished/tenant-installed freezer. Refer to Part 9 under Liability Major Zones, Kitchen.

## 12.4 DISHWASHERS

Dishwashers shall conform to UL 749, Household Electric Dishwashers, under counter with drain, and shall be UL listed, electric type, with air gap, racks, lift-out utensil holder, spraying arms, and detergent dispenser. Unit shall be listed as "Energy Star" compliant and shall bear the "Energy Star" label. Refer to Part 3 for additional information. The automatic controls shall cycle through the Wash, Rinse, Dry / Heat, and Stop phases, and shall be capable of rinse and hold cycle as well as a no heat drying feature. The unit shall contain instantaneous, or in-line, water heater booster, with automatic thermostat set for 140 degrees F. Rated energy use for standard capacity models will not exceed 620 kWh/yr. A plug connector is required. Preferred dishwasher has features equal to Model GU1100XTL\_ Series by Whirlpool (Whirlpool Gold Accuwash Wash System).

## 12.5 GARBAGE DISPOSALS

Garbage disposals shall conform to UL 430 and ASSE 1008; Waste Disposers; continuous feed, minimum 370 watt 1/2 HP motor, stainless steel grinding elements, two 360-degree stainless steel swivel impellers, manual motor reset, and sound insulation. A plug connector is required. Preferred disposal is Insinkerator or equal.

## 12.6 RANGES AND OVENS

Provide electric ranges, 30-inch width, freestanding type with porcelain enamel cook-top, oven, clock and timer, oven light, and cooking surface light. Ovens shall have both broil and bake function. Ovens shall have black glass window door, broiler pan, and self-lock racks. *Self-cleaning ovens are considered a desirable feature*.

Ranges shall have two, 6-inch and two, 8-inch burners, with a fully closed "drip-less" cook top. Preferred range has features equal to Model RF368LXK\_ Series by Whirlpool (30-Inch Self-Cleaning Freestanding Electric Range).

## 12.6.1 RANGE HOODS

Provide metal range hoods, the same length, finish and color as the range, with separately switched light and exhaust fan. The hood shall be designed to be recirculating, shall not be vented to the outside, and shall have a washable filter. The fan shall be two-speed or variable speed and shall have a capacity of not less than 50 cubic ft per minute per linear foot of range hood. The sound level shall not exceed 6 sones.

## 12.7 MICROWAVE OVENS

Microwave ovens are not required but may be provided by occupants. Provide space for tenant-furnished/tenant-installed microwave. A dedicated circuit shall be provided for a microwave oven in the kitchen.

#### 12.8 DOOR OPENER

Provide a flush mounted ceiling electrical outlet for the future installation of a garage door opener.

If provided as a betterment, the automatic garage door opener shall have safety sensors, instant reverse and overload protection. A 1/3 HP minimum motor shall be provided for single garage door openings and a 1/2 HP minimum motor shall be provided for double garage door openings. Motor shall be removable without affecting the limit switches. Opener shall be provided with adjustable limit switch settings, a remote control, and a wall mounted push button control, which is located near the door from the garage into the housing unit. For each garage door, provide two (2) automobile remote control devices and one (1) entry keypad on the outside of the garage near or on the jamb of the overhead garage door. Instead of a plug connector, provide all concealed wiring.

## 12.9 MAJOR APPLIANCES CHECKLIST

□ For each different unit provided, submit documentation in accordance with Section 00110, "Tab 7 Housing Unit Concept Design – Submittal Requirements", including CONSTRUCTION MATERIALS, PRODUCTS, EQUIPMENT AND SYSTEMS work sheets required for the refrigerator, dishwasher, garbage disposal, range oven, and range hood.

# PART 13 - UNIT DESIGN - HVAC

# **INDEX**

13	UNIT	DESIGN - HVAC	2
13	.1 Hv	AC DESIGN	2
	13.1.1	Load Calculations	
	13.1.2	Duct System Layout	3
13	.2 Equ	JIPMENT SAFETY AND EFFICIENCY	3
	13.2.1	Equipment	3
	13.2.2	Efficiency	3
13	.3 HEA	ATING AND COOLING SYSTEMS	3
	13.3.1	Mechanical Space	4
	13.3.2	Forced warm air systems	
	13.3.3	Split system air conditioning	
	13.3.3.	<del>- 1 - 1</del>	
	13.3.3.	1	
	13.3.3.		
	<i>13.3.4</i> 5.4 Air	Unacceptable Systems.	
	.4 AIR 13.4.1	DISTRIBUTION	
	13.4.1	Supply diffusers	
	13.4.2	Ductwork	
	13.4.4	Filtration	
	10	ERMOSTATS.	
	13.5.1	Operation	
		HAUST FANS	
13		YER VENTS	
13		NG REQUIREMENTS.	
13		TIC VENTILATORS	
		ESTING, ADJUSTING, AND BALANCING	
		OUCT TIGHTNESS TESTING REQUIREMENTS	
	13.11.1	Testing	
	13.11.2	Random Testing	
13	.12 U	JNIT DESIGN – HVAC CHECKLIST	

## 13 UNIT DESIGN - HVAC

## 13.1 HVAC DESIGN

Heat gain and loss calculations shall be, as a minimum, in accordance with the current edition of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals. The cooling load calculations shall be in accordance with ASHRAE Residential Cooling Load Calculations. Computer-generated load calculations shall be provided at the 100% design submittal after contract award, and shall include complete input and output summaries. Design shall be based on the weather data shown in Table 13-1. Air-cooled condenser shall be selected to meet the calculated cooling load at an ambient temperature of 92 degrees F. Refer also to Part 3 for energy performance and sustainability criteria.

Type of Design / Design Information	
Heating	
Indoor Design Temperature	72 degrees F
Outdoor Design Temperature	0 degrees F
Annual Heating Degree Days	9625
Cooling	
Indoor Design Temperature	78 degrees F
Outdoor Design Dry Bulb Temperature	93 degrees F
Outdoor Design Wet Bulb Temperature	76 degrees F

## 13.1.1 LOAD CALCULATIONS

Computer generated load calculations shall be performed for each possible orientation up to four representative orientations for each building type included in the project and provided at the 100% design submittal after contract award (see Section 01332 SUBMITTALS DURING DESIGN). Room airflow requirements shall be computed based on the individual room load. However, the minimum acceptable airflow shall be 0.5 cfm/ft² for all spaces. Load calculations shall include a 10% safety factor for cooling and a 30% safety factor for heating. Natural infiltration rates of 0.35 AC/hr shall be an acceptable value for calculations. The design for each individual housing unit shall be based on the heating and cooling loads as well as room airflow requirements computed for the building type and orientation, which it most closely matches. Heating load calculations shall be made without regards for people, lights, equipment, solar wall, roof gains or passive solar gains. Table 13-2 below identifies the internal loads, which shall be included in the computerized cooling load calculations.

TABLE 13-2 – INTERNAL HEATING AND COOLING LOADS

INTERNAL LOAD DESCRIPTION	ANTICIPATED INTERNAL LOADS
2 BR	3 people (230 Btu/hr each)
3 BR	4 people (230 Btu/hr each)
4 BR	5 people (230 Btu/hr each)
Hours of Use	24 hours/day
Additional Sensible and Latent Loads	Kitchen, Laundry, and adjoining rooms: 938 KW [3200 BTUH]
Hours of Use	6:00 a.m. to 10:00 p.m.

#### 13.1.2 DUCT SYSTEM LAYOUT

For a given building type, a single duct layout may be used regardless of orientation, provided that the system is sized to provide the required airflow for each room at its worst case orientation. Balancing dampers shall then be used to reduce airflow to the appropriate level as required. Permanent access to dampers shall be provided.

## 13.2 EQUIPMENT SAFETY AND EFFICIENCY

All materials and equipment shall be the standard cataloged product of manufacturer's regularly engaged in production of such materials and equipment, and shall be the manufacturer's latest standard design. Each major component of the heating and cooling system[s] shall have the manufacturer's information on a plate secured to the equipment.

## 13.2.1 EQUIPMENT

Equipment shall comply with the requirements of American Gas Association (AGA), American National Standards Institute (ANSI), Air Conditioning and Refrigeration Institute (ARI), American Society for Testing and Materials (ASTM), Gas Appliance Manufacturers Association (GAMA), National Electric Manufacturers Association (NEMA), National Fire Protection Association (NFPA), Underwriters Laboratories, Inc. (UL), International Mechanical Code, ASHRAE 90.2P or other national trade associations as applicable.

## 13.2.2 EFFICIENCY

Equipment efficiencies as listed in Part 3 are minimum acceptable levels.

## 13.3 HEATING AND COOLING SYSTEMS

Each housing unit shall be provided with central heating and air conditioning system[s]. Air conditioning system shall be sized to meet the total load determined by computer calculations and matched to the furnace airflow capacities. Supply and return duct distribution systems shall be designed, installed, balanced, and adjusted to distribute heat and cooling to all habitable rooms, as well as bathrooms and to entry vestibule, in proportion to the calculated load requirements of these spaces. Fans in air handlers and

furnaces shall be multi-speed, direct drive type. System installation shall conform to SMACNA Installation Standards for Residential Heating and Air Conditioning Systems except as altered by this document.

#### 13.3.1 MECHANICAL SPACE

Mechanical space shall be provided to house all mechanical equipment. Exterior air conditioning units shall be concrete pad-mounted, located away from the front of the building and not in view from the street. Effort shall be made to locate the unit(s) out of the occupant's direct line of sight (i.e. screen with shrubbery or wall, locate on sides of housing unit, avoid placement under windows, etc.). However, the primary concern shall be coordination with the mechanical area location. Mechanical equipment (i.e. furnace and hot water heater) shall be located in an internally accessible room, arranged to allow for ease of maintenance, and for proper venting. This room shall be provided with a light and electrical receptacle. The mechanical equipment room layouts shall be provided with ample floor space to allow for unobstructed access to accommodate routine servicing and maintenance of equipment and to have sufficient headroom to accommodate required equipment. Provisions for installation, removal, and future replacement of equipment shall be coordinated with the architectural design. All piping and equipment located in finished areas of the building shall be concealed or furred-in; exposed piping and equipment is only allowed in unfinished areas, and the equipment room.

#### 13.3.2 FORCED WARM AIR SYSTEMS

Warm air furnaces shall be induced combustion, natural gas furnaces. Furnaces shall be equipped with electronic pilotless ignition. Natural gas furnaces shall be equipped with a flue to exhaust flue gases above the building roof. Units shall be vented in accordance with NFPA 211. Roof flue vent shall be located back-slope of the roof so as not to be visible from the front of the housing unit. Combustion air shall be provided from the outside in accordance with IMC or model codes. Combustion air shall be provided in accordance with SMACNA Installation Standards for Residential Systems. Furnaces shall be equipped with centrifugal fan, disposable filters (filters shall be easily accessible to the occupants), controls, and transformer. Fans shall be multi-speed, direct-drive type. It shall be possible to service and replace all controls and internal components from one side of the furnace. Heat exchangers shall be guaranteed for a minimum service life of 20 years. Furnaces shall be equipped with a cooling coil by the same manufacturer, matched to the selected air conditioning equipment.

## 13.3.3 SPLIT SYSTEM AIR CONDITIONING

## **13.3.3.1** Equipment

Electric crankcase heaters.

Electric air conditioning equipment shall consist of an air-cooled condensing unit and evaporator as matched components with the furnace, all by the same manufacturer, all with a manufacturer's 10-year extended warranty. Refrigerants used shall have an Ozone Depletion Potential (ODP) of .055 or less. The condensing unit shall contain, as a minimum, the features indicated in Table 13-4. Equipment shall be sized to meet the total load determined by computer calculation. Equipment may be oversized to no more than 125 percent of the computer generated load. Fans shall be multi-speed, direct drive type.

## TABLE 13-4 – SPLIT SYSTEM AIR CONDITIONING FEATURES

High and low pressure compressor protection.

Filter-drier.

Hermetically sealed compressor with built-in overloads and locked rotor protection.

#### TABLE 13-4 – SPLIT SYSTEM AIR CONDITIONING FEATURES

Anti-short-cycle timer. (factory installed)

Testing and charging refrigerant connections.

Compressor guaranteed for a minimum service life of 5 years.

Fan and coil (hail) guards.

## 13.3.3.2 Evaporator Coil

The evaporator coil shall be provided with a liquid strainer, expansion device, pre-insulated housing, copper or aluminum coil, and insulated plastic condensate drain pan. Coil face velocity shall be limited to 550 fpm. Condensate drain lines shall be one size larger than the drain pan connection, be properly trapped, and piped to the exterior of the unit. Provide a rodent and insect screen at the exterior terminus. Refrigerant lines running between the condensing unit and the evaporator shall be concealed, except in the furnace room.

## 13.3.3.3 Condensing Unit

The condensing unit and matched coil shall deliver a Seasonal Energy Efficiency Rating (SEER), consistent with the minimum requirements indicated in Part 3. The condensing unit shall be installed in accordance with the manufacturer's recommendations.

## 13.3.4 UNACCEPTABLE SYSTEMS

Room unit heaters, space heaters, room (window) or through-the-wall air conditioning units, floor furnaces, gravity warm air systems, evaporative coolers, heat pumps, and electric resistance heaters or heat lamps are not permitted.

## 13.4 AIR DISTRIBUTION

Provide systems conforming to the recommendations of the ASHRAE Air Distribution Manual. For two-floor housing units with a single air conditioning unit, provide separate, main supply ducts with volume control dampers for each floor. These main ducts shall be run directly from the air handler or furnace to the appropriate building level. As a minimum, provide a separate ducted return for each floor level. Two-floor housing units with 1,000 ft<sup>2</sup> or greater net floor area on each floor shall be provided with a separate heating and cooling unit and supply and return ducted system for each floor. The air distribution system shall be designed to provide a maximum air transport factor of 5.5 when calculated as follows:

Air Transport Factor = (Space Sensible Heat Removal)/(Supply fan Power Input + Return Fan(s) Power Input) where the heat removal in above and power input are measured in watts [Btu/h].

#### 13.4.1 SUPPLY DIFFUSERS

Ceiling and baseboard supply diffusers shall be located to ensure that the air distribution will completely cover all surfaces of exterior walls with a blanket of conditioned air. At least one diffuser shall be provided in each habitable room. Diffusers shall be lever operated, resident accessible, have louvered faces with individually adjustable blades, and shall be provided with integral opposed blade damper. Diffusers shall be provided with air deflectors as required for proper airflow in the space. Plastic diffusers are prohibited. Core velocity shall be limited to 600 fpm maximum, with a maximum pressure drop of 0.1-inch water.

Airflow from any single diffuser shall be limited to 200 cfm maximum. Ceiling mounted units shall have factory finish to match ceiling color, and be installed with rims tight against ceiling. Sponge-rubber gaskets shall be provided between ceiling or wall and surface-mounted diffusers for air leakage control. Suitable trim shall be provided for flush-mounted diffusers. Duct collar connecting the duct to diffuser shall be airtight and shall not interfere with volume controller. Wall supply registers shall be installed at least 6 inches below the ceiling.

### 13.4.2 RETURN AND EXHAUST GRILLES

Grilles shall be fixed horizontal or vertical louver type similar in appearance to the supply diffuser face. Plastic units are prohibited. Core velocity shall be limited to 400 fpm maximum, with a maximum pressure drop of 0.06-inch water. Grilles shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Wall return grilles shall be located at least 6 inches above the floor. Return grilles shall be located in hallways, or other normally unoccupied spaces to minimize the sound level in occupied spaces.

### 13.4.3 DUCTWORK

Supply and return ductwork shall be externally insulated in unconditioned spaces and unheated mechanical rooms with sheet metal (no fiberboard or flexible metal is allowed). Sub-slab and intra-slab ductwork is also prohibited. Volume dampers shall be provided at each branch take-off. All ductwork shall be concealed (except in a basement or crawl space), in walls, or below floor of upper stories. Supply ductwork shall not be located in the attic. Permanent access to dampers shall be provided. No portion of the building construction (i.e. joist space in a floor or ceiling, wall stud space, etc.) shall be used as a duct. Exhaust fan ductwork shall be insulated.

- a) Maximum velocity in supply ducts shall be limited to 900 fpm for mains and 600 fpm for branches.
- b) Ducts shall be airtight with no visible or audible leaks to ensure quiet, economical system performance. Ductwork in conditioned spaces shall be constructed for a 1 inch static pressure construction class with seal class C, as described in the SMACNA HVAC Duct Construction Standard, unless a higher pressure class and/or seal class is required by actual, system operating conditions. Ductwork in unconditioned spaces shall be constructed for a 2-inch static pressure construction class with seal class C, unless a higher-pressure class and/or seal class is required by actual, system operating conditions. All duct seams and joints shall be sealed using duct mastic. Tape shall not be used as a means for sealing ductwork.
- c) Provide a minimum of 2-inch thick mineral fiber insulation (or other listed insulation with an equivalent R-value) on the exterior of exhaust, supply, return ducts in unconditioned spaces. Insulation shall be faced with a vapor barrier material having a performance rating not to exceed 1.0 perm. Insulation, vapor barrier, and closure systems shall be non-combustible as defined in NFPA 255, with a flame-spread rating of not more than 25, and a smoke development rating of not more than 50, as defined in ASTM E-84.
- **d)** Return air ductwork shall be sized for a maximum velocity of 900 fpm.

## 13.4.4 FILTRATION

Utilization of electrostatic filters is desirable. At a minimum however, provide a pleated 1-inch panel filter, sized for and installed in the return air system in accordance with UL 900. No filter shall be located within the furnace enclosure. Filter shall be rated for 20 percent efficiency as determined by ASHRAE 52; Method of Testing Air Cleaning Devices used in General Ventilation for Removing Particulate Matter. All filters shall be easily accessible for changing and maintenance. Refer to Part 12 for Kitchen exhaust hoods filters.

## 13.5 THERMOSTATS

Thermostats shall be located on interior partitions, approximately 5 ft above the finished floor. Locating a thermostat on the wall adjacent to a stairway, on an exterior wall or where it is subject to unrepresentative temperatures is unacceptable. For two-story units, the use of multiple thermostats and a residential zone controller is considered a betterment. Refer also to Part 3 for energy performance criteria.

### 13.5.1 OPERATION

Thermostats shall be manually operated single set point for heating and cooling with digital read out, and shall contain a switch for summer or winter settings. Programmable thermostats are not permitted.

### 13.6 EXHAUST FANS

Exhaust fans shall be provided in all baths, toilet rooms, laundry rooms, and kitchens. Bathroom exhaust fans shall be ducted to the outside. Exhaust fans shall not discharge near the air conditioning condensing unit, windows, balconies, entry doors, patio or balconies, attics or garages. Fans shall be tested and rated in accordance with AMCA 210, or HVI, and shall operate with 120-volt, single-phase power supply. Each fan shall have a removable front grille and be controlled by a dedicated wall switch. Exhaust fans shall be provided with backdraft damper. Bathroom and Laundry Room exhaust fans are required, regardless of an operable window, and shall be ceiling mounted and shall be sized to provide not less than 10 air changes per hour in the space served. These exhaust fans shall be switched separately from light switches. Maximum allowable noise level for bathroom exhaust fans shall be 4 sones as installed. Where exhaust fans are ducted through the attic to the roof, they shall extend above the roof per code and be provided with a weatherproof cap. Double wall UL-listed chimney shall be provided. Plastic or flexible metal ductwork shall not be used.

## 13.7 DRYER VENTS

A 4-inch diameter dryer vent shall discharge to the exterior with weatherproof wall jack and backdraft damper, and provide connection to occupant-owned dryer (one dryer per vent). The vents shall be rigid aluminum with exterior wall cap and backdraft damper. Vent pipes shall be a maximum of 20 ft long, with no more than three right angle elbows (with minimum radius of 6 inches), and have a maximum vertical run of 12 ft. Dryer vents shall not exhaust near the air conditioning condensing unit, windows, balconies, entry doors, patio, or garages. Dryer vents shall not run through non-accessible spaces, attics or garages.

### 13.8 PIPING REQUIREMENTS

Air conditioner condensate drains, refrigerant suction, and exterior refrigerant liquid lines shall be insulated with a minimum of 1 inch thick cellular glass or unicellular foam pipe insulation. Exterior refrigerant line insulation shall be encased in either an aluminum or PVC jacket to prevent damage. Condensate lines shall be one size larger than the drain pan connection, be properly trapped, and not directly connected to a sanitary sewer system (an air gap fitting is required).

## 13.9 ATTIC VENTILATORS

Gravity attic ventilators shall be of all metal construction, and shall have self-flashing to insure leak-proof installation. Ventilators shall be sized to ventilate the attic space at a minimum rate of 0.6 cfm/ft<sup>2</sup>. The Contractor and Contractor's Architect-Engineer shall coordinate the inlet and outlet areas available for attic ventilation to insure proper fan performance.

## 13.10 TESTING, ADJUSTING, AND BALANCING

Adjusting and balancing of each housing unit shall be the Contractor's responsibility. A firm certified for testing by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) shall accomplish testing independent of, and not subcontracted to the Contractor's HVAC subcontractor. The selected standard shall be used throughout the project. Instrumentation accuracy shall be in accordance with the standard selected. Prior to testing, adjusting, and balancing, the Contractor shall verify that the systems have been installed and are operating as specified. Where specific systems require special or additional procedures for testing, such procedures shall be in accordance with the standard selected. Approved detailed drawings and all other data required for each system and/or component to be tested shall be made available at the job site during the entire testing effort. Testing shall not commence until approved by the Contracting Officer. The facility shall be essentially complete with final ceiling, walls, windows, doors, and partitions in place. Doors and windows surrounding each area to be balanced shall be closed during testing and balancing operations. Air systems, hydronic systems, and exhaust fans shall be complete and operable. All data, including deficiencies encountered and corrective action taken, shall be recorded. Following final acceptance of certified reports by the Contracting Officer, the setting of all HVAC adjustment devices shall be permanently marked by the Contractor's balancing engineer so that adjustment can be restored if disturbed at any time. Following adjusting and balancing, testing of air and water systems shall be performed on 10 percent of the project buildings (not to exceed 10 buildings) which have been randomly selected by the Contracting Officer. If buildings are to be turned over in phases, testing shall be performed on 10 percent of the buildings completed in each phase (not to exceed 10 buildings per phase). No additional testing will be required if at least 90 percent of the tested buildings pass the test requirements. If less than 90 percent of the tested buildings pass the test, an additional 10 percent of the project buildings (not to exceed 10 buildings) shall be tested. This process shall continue until 90 percent of the total number of tested buildings pass. The contractor shall correct all housing units not found in compliance, and shall be responsible for all labor and materials required for this effort. AABC MN-1, or NEBB-01 shall be used as the standard for providing testing of air and water systems.

## 13.11 DUCT TIGHTNESS TESTING REQUIREMENTS

The installation of the supply and return ductwork within the units is an item of prime concern with respect to the energy efficient operation of the housing unit as a whole. With that consideration in mind, for heating and air conditioning designs which include ductwork outside of the conditioned envelope, the contractor will be required to test the proto-type units to ascertain the leakage levels from the ductwork in accordance with the following requirements. For system designs, which place all the ductwork within the conditioned envelope of the structure, no ductwork testing will be required.

## **13.11.1 TESTING**

Duct tightening testing is in addition to the building envelope testing referenced in Part 3 and Part 9. Duct tightness testing shall ensure that the leakage rate from ductwork (Where the ductwork system is not entirely within the conditioned envelop) shall not exceed 0.03 cfm/ft <sup>2</sup>. If the prototype units fail to meet this requirement, the ductwork installation shall be examined, corrections made, and the test redone until the installation passes this requirement. No ductwork systems may be installed in other units until the prototype units ductwork systems have been validated. Several methods to accomplish this testing are acceptable.

- a) Testing may be done in accordance with ASTM Standard E 1554-94, "Determining External Air Leakage of Air Distribution Systems by Fan Pressurization". This method describes the process and methodology required to accomplish basically a 'blower door subtraction' method of duct tightness testing.
- **b)** Testing may also be accomplished utilizing "Duct Blaster" methodologies and pressurizing the ductwork to 0.1 inch of water.

## 13.11.2 RANDOM TESTING

The contractor is advised that the Missouri Department of Natural Resources may test, or hire a consultant to test randomly selected housing units constructed in this project. These tests will be completed without cost to the contractor; however, the contractor will be required to coordinate access to the selected unit. If accomplished, this testing is not expected to interfere or delay the construction contractor in any manner.

## 13.12 UNIT DESIGN - HVAC CHECKLIST

□ For each different unit provided, submit documentation in accordance with Section 00110, "Tab 7 Housing Unit Concept Design – Submittal Requirements".

## PART 14 – UNIT DESIGN – ELECTRICAL

## **INDEX**

14	UNIT	DESIGN - ELECTRICAL.	2
14.1	Coi	NFORMANCE TO CODE	2
14.2	SER	RVICE ENTRANCE	2
14.3	PAN	NEL LOCATIONS	2
14	4.3.1	Panel Boards	2
14	1.3.2	Secondary Overcurrent Devices	2
14.4	Co	NDUCTORS	2
14.5		TLET CIRCUITS	
14.6	Ex	TERIOR LIGHTING AND OUTLETS	2
14	1.6.1	Security Lighting	3
14	1.6.2	Ground-Fault Circuit-Interrupter Outlets	3
14	1.6.3	Illuminated House Numbers	
14.7	Int	ERIOR LIGHTING AND SWITCHED OUTLETS	3
14	1.7.1	Efficiency	3
14	1.7.2	Locations	3
14	1.7.3	Ceiling Fan	
14	1.7.4	Lighting Fixture Design	4
14.8		TECTORS	
	1.8.1	Smoke detectors	
14	1.8.2	Carbon Monoxide (CO) detector/alarm	
14.9		LEPHONE	
	1.9.1	Minimum Outlets	
14	1.9.2	Mounting	
14.1		CABLE TELEVISION	
	4.10.1	3	
14.1		DOOR BELL	
14.1		CONVENIENCE OUTLETS	
14.1		SPECIAL OUTLETS	
14.1		Wiring	
14.1		BRANCH CIRCUIT CONDUCTORS	
14.1		COORDINATION OF SWITCH PLATES AND OUTLET PLATES	
14.1	7 L	JNIT DESIGN – ELECTRICAL CHECKLIST	7

## 14 UNIT DESIGN - ELECTRICAL.

### 14.1 CONFORMANCE TO CODE

The electrical system shall be designed in compliance with the rules and recommendations of IEEE C2, National Electrical Safety Code; Illuminating Engineering Society (IES) Standards; NFPA 70, National Electrical Code (NEC), and applicable model codes, whichever is more stringent. Provide main circuit breaker in the interior main panel for each housing unit, sized in accordance with the NEC.

All equipment, materials, fixtures, and other appurtenances shall be suitable for the intended application, and shall conform to and be installed per the National Electrical Manufacturer's Association, American National Standards Institute, Institute of Electrical and Electronics Engineers, Underwriters' Laboratories, and all other applicable standards/regulations/codes.

## 14.2 SERVICE ENTRANCE

Service entrances shall be enclosed or sight screened. Service feeders shall be underground. Meters are not required, but make provisions for future meters, in accordance with the requirements of Part 8.

## 14.3 PANEL LOCATIONS

#### 14.3.1 PANEL BOARDS

Panel boards (minimum 200 amp panel at each unit is required) shall be located inside the housing units (not in the garage). Panel boards shall be painted galvanized steel and furnished with main breakers. Panel board doors shall be flush one-piece fronts. Panel boards shall be recessed. Offset a minimum of 400 mm [16 inches] horizontally back-to-back panel boards. No recessed panel boards are to be located in party walls and firewalls.

## 14.3.2 SECONDARY OVERCURRENT DEVICES

All secondary overcurrent devices shall be of the circuit breaker type, installed in dead-front, recessed enclosures, and shall be located inside the housing unit in the utility or laundry room or hallway and shall be readily accessible to the housing unit occupants.

## 14.4 CONDUCTORS

All interior wiring shall be copper.

### 14.5 OUTLET CIRCUITS

Lighting and convenience outlets shall be on separate circuits. Outlets on party walls shall be offset to maintain integrity of the firewall and sound deadening rating of the wall.

## 14.6 EXTERIOR LIGHTING AND OUTLETS

Provide energy efficient high quality lighting outside each housing unit. The minimum efficiency standard for lighting is 50 lumens/watt. This efficiency can be achieved with fluorescent and compact fluorescent lighting. Lighting must also be color corrected with a Color Rendering Index (CRI) of 60 or better. Provide a minimum of one lighting fixture switched from the housing unit interior at each housing unit's

entry, and patio area(s). Light fixtures at entry and patio areas shall be switched from the housing unit interior. These lights shall be controlled by photocell, activated by minimum light levels of 0.5 footcandle.

#### 14.6.1 SECURITY LIGHTING

At the rear corner of each building, provide a surface-mounted flood light controlled by a motion sensor.

#### 14.6.2 GROUND-FAULT CIRCUIT-INTERRUPTER OUTLETS

Provide a minimum of one Ground-Fault Circuit-Interrupter duplex outlet at each unit's front entrance, garage (quantity of 2), and patio area(s). In addition, provided one GFCI duplex outlet in the ceiling of the front porch that is switched from inside the front entry closet. These are in addition to those required by code in bathrooms, kitchens, and laundry rooms. Ground-Fault Circuit-Interrupter (GFCI) circuits shall be designed only for outlets requiring GFCI protection in accordance with the National Electrical Code. No other outlets shall be connected to GFCI circuits.

## 14.6.3 ILLUMINATED HOUSE NUMBERS

Provide exterior wall mounted light fixture with integral house unit numbers similar to Address-O-Lite 54833 Black. The fixture shall be on the same circuit as the front entry light fixture and shall turn on automatically at dusk and turn off at dawn using a photocell that activates by minimum ambient light levels of 0.5 foot-candle. Locate underneath porch roof, visible from the street, mounted between 48 and 72 inches above finish floor of units' main level. Contractor is responsible for obtaining the house numbering system from the Contracting Officer. Type face shall be similar to Helvetica.

## 14.7 INTERIOR LIGHTING AND SWITCHED OUTLETS

### 14.7.1 EFFICIENCY

Interior lighting will be both efficient and color corrected. Refer also to Part 3. Fluorescent fixtures shall be used wherever possible. Color Rendering Index (CRI) of 85 or better and a standard lighting color of 3500 K are required. Contractor shall provide product data and model number of items to be supplied in accordance with Section 01332, SUBMITTALS DURING DESIGN. Preferred manufacturers are Philips, Alto; General Electric, Ecolux; Sylvania, Octron; or equal. Minimum efficiency standards for lighting are as follows:

- a) Fluorescent tubes 4 ft and longer: 90 lumens/watt.
- **b)** Fluorescent tubes less than 4 ft: 80 lumens/watt.
- **c**) Compact fluorescent and other lamps: 50 lumens/watt.

### 14.7.2 LOCATIONS

Provide light fixtures operated by wall switches for all rooms except living rooms. Provide one switched outlet for occupied furnished lamps in living room. Floor mounted duplex outlets with metal coverplate may be necessary in living rooms to accommodate optimum arrangement of the furniture. Switches and coverplates shall be white in color. Wall-switch operated ceiling lights shall be provided in dining and utility rooms, halls, bedrooms, kitchens, dinette or breakfast bar areas, and basements. Additional light fixtures shall be provided in rooms whose configuration requires them for adequate lighting. Wall-switch operated wall-mounted lights shall be provided in bathrooms and half baths located above the mirror over the lavatory. Walk-in closets and interior and exterior bulk storage rooms shall be provided with wall-

switch ceiling lights. A minimum of one lighting fixture, ceiling or wall mounted, as appropriate, shall be provided in the garage. Where exterior bulk storage is located within the enclosed walls of a garage, each space shall be lighted separately. A switch (switches) located at each door opening into the garage shall control garage lights. If automatic garage door opener is installed by Contractor, as part of this contract, a garage light switch can be eliminated adjacent to the overhead garage door. Provide separate switches to control light fixture and ceiling fan.

- a) Dining room ceiling light fixtures shall be fixed suited for typical dining room furniture arrangement. Fixtures may be designed for incandescent use, and do not have to meet the 50 L/Watt requirement. Provide a dimmable switch.
- b) The general lighting intensity in kitchens shall be 30 to 50 foot-candles. Supplementary lighting shall be provided at the sink and under one of the wall cabinets for a work center to produce a composite lighting level of 75 foot-candles using either down-lights, surface fluorescent fixtures surface-mounted below wall cabinets or wall-mounted fixtures (5 ft and higher above the floor) as appropriate.
- c) Wall sconces controlled by wall switches are considered desirable as replacement for ceiling mounted lights in hallways and family rooms. Such sconces added to living rooms are also considered desirable.
- **d**) Inside each closet, provide a light fixture with a fluorescent lamp (compact or otherwise) on wall above door for best dispersion of light.

#### 14.7.3 CEILING FAN

In accordance with the energy performance requirements of Part 3, provide quality ceiling fans connected to a wall switch for an on/off operation. Ceiling fans should be combined with ceiling light fixtures where appropriate. Switch lights and fans from separate wall switches. Fan speed and direction may be controlled by pull chains and unit switches.

## 14.7.4 LIGHTING FIXTURE DESIGN

The Offerer shall include with the Offer pictorial product data sheets of key interior lighting fixtures proposed. The aesthetic design of these fixtures should compliment and enhance the architectural style of the house.

## 14.8 DETECTORS

## 14.8.1 SMOKE DETECTORS

In accordance with the latest issue of Underwriters Laboratories UL-217, detectors shall be residential application, ionization type, powered by 60 Hz, 120VAC source, and shall be built-in type with pigtail power connection. Smoke detectors shall include LED indicator lamp, test switch, and shall reset automatically when smoke clears. Horn shall be rated at 85 decibels at 3m [10 feet]. Smoke detector bases shall be flush with quick male-female plastic snap on connectors for ease of mounting and dismounting the smoke detector. Smoke detectors shall also include battery back-up power. A low battery condition shall be annunciated by intermittent beeps, until user replaces it.

a) Provide hard-wired smoke detectors on a separate circuit inside and near the door of each bedroom, and in the hallway near the convergence with the family or living rooms in each housing unit in accordance with NFPA 72, NFPA 101 and the Uniform Building Code. In 2-story units, provide smoke detectors on the second floor in similar locations as the first floor. Alarm signal from one detector shall be wired to sound all detectors in that family housing

unit.

#### 14.8.2 CARBON MONOXIDE (CO) DETECTOR/ALARM

In accordance with the latest issue of UL-2034, detectors shall be residential application, multiple station powered by a dedicated 60 Hz, 120VAC source (separate from the 120VAC source for the smoke detectors), capable of being interconnected with up to 11 identical detectors. Carbon monoxide detectors shall be 100% solid state, have a biomimetic sensor and meet sensitivity requirements of UL-2034. Detectors shall incorporate an 85dB electronic horn at 10 feet that will sound an early warning or full alarm depending on the level of CO. Detector shall include LED indicator lamp, test switch, and shall reset automatically when level of CO clears. CO detector bases shall be flush with quick male-female plastic snap on connectors for ease of mounting and dismounting the carbon monoxide detector. Carbon monoxide detectors shall also include battery back-up power. A low battery condition shall be annunciated by intermittent beeps, until user replaces it. Provide CO detectors minimum one each level of housing unit and in the vicinity of the bedrooms (e.g., in the hall outside of each bedroom and as recommended by CO detector manufacturer). Alarm signal from one CO detector shall be wired to sound all CO detectors in that family-housing unit.

## 14.9 TELEPHONE SYSTEM

The Contractor in accordance with the telecommunications company on the Installation shall provide the interior telephone system. The telephone system wiring as specified herein incorporates requirements for an updated system to comply with the Telecommunications Industry Association (TIA/EIA) Standard 570A for structured wiring in residences. Cable and jacks shall comply with TIA/EIA Standard 568A, Commercial Building Telecommunications Cabling Standard. This approach prepares the homes so that the residents can take full advantage of the broadband services available today as well as those coming in the future.

Provide the housing unit telephone system in accordance with Paragraph 4.10.1 of the Air Force Family Housing Guide, the requirements of the local telephone provider, and the following. Also refer to Part 8 for additional requirements regarding the telephone distribution system.

Any costs or fees associated with this work are the responsibility of the Contractor.

### 14.9.1 SERVICE ENTRANCE

Provide two-line capability for each housing unit. Service riser to be 1-inch conduit concealed in the exterior wall. Also refer to Part 9 for requirements in the Mechanical Room/Area.

#### 14.9.2 INTERIOR WIRING

All telephone system wiring shall be Category 5 cable or better, concealed, home run style from telephone distribution box in mechanical room to each telephone jack location. Provide one telephone jack with two-line capability (voice and data) in each of the following rooms: family room, living room, kitchen, and all bedrooms. Required telephone and television jacks shall be collocated. In addition, provide 5 more jacks with two-line capability. During the design phase after award, the Government will provide the successful contractor with a location layout for all jacks within each different unit.

## 14.9.3 MOUNTING

Outlets shall be flush mounted in walls at an appropriate height above the floor. Outlet plates shall be white in color. Covers shall be parallel to the floor.

### 14.10 CABLE TELEVISION

The Contractor shall provide the interior cable TV system utilized by the local Cable TV provider. The cable television system wiring as specified herein incorporates system requirements complying with the Telecommunications Industry Association (TIA/EIA) Standard 570A for structured wiring in residences. This approach prepares the homes so that the residents can take full advantage of the broadband services available today as well as those coming in the future.

Provide the housing unit cable television system in accordance with Paragraph 4.10.1 of the Air Force Family Housing Guide, the requirements of the local cable television provider and the following. Also see Part 8 for additional requirements regarding the cable television distribution system.

Any costs or fees associated with this work are the responsibility of the Contractor.

### 14.10.1 SERVICE ENTRANCE

Service riser to be 1-inch conduit concealed in the exterior wall. Also refer to Part 9 for requirements in the Mechanical Room/Area.

#### 14.10.2 INTERIOR WIRING

Provide one flush-mounted cable television jack in each of the following rooms: family room, living room, kitchen, and all bedrooms. In addition, provide 5 jacks. During the design phase after award, the Government will provide the successful contractor with a location layout for all jacks within each different unit. All cable television system wiring shall be concealed, home run style from cable television system distribution box to each individual television jack location. Each cable shall be provided with an appropriate tag, inside the terminal box, showing housing unit number and outlet location (e.g. Unit 2, family room north). Required telephone and television jacks shall be collocated.

## Cable Television Placement Specifications are as follows:

- RG-6 60% shielding cable is required for all in-house wiring
- No outlets shall be LOOPED TOGETHER.
- All outlets shall be connectorized with an approved weather sealed connector. (Crimp type-NO SCREW-ON CONNECTORS).
- Each outlet, at the internal connection point, shall be equipped with a barrel wall plate.
- To assure that cable installation has not staples or tacks placed in or on the cable that cause a puncture or flattening of the cable, a visual inspection of all installed cables shall be performed prior to wall covering (sheet rock) installation. Prior to acceptance of the completed system, a commissioning test shall be performed using a known signal source and measuring and recording the signal strength at each outlet. Contractor shall submit the proposed commissioning test procedure for Contracting Officer acceptance a minimum of 30 days prior to testing the first cable installation.

#### **14.10.3 MOUNTING**

Cable TV outlets shall be flush mounted in walls at 18 inches above the floor unless directed otherwise. Outlet plates shall be white in color.

#### 14.11 DOOR BELL

The front entrance to each housing unit shall be provided with a low voltage bell or buzzer. Refer to Part 9 for requirements.

### 14.12 CONVENIENCE OUTLETS

In addition to outlets required by NEC, provide convenience duplex outlets in the following areas:

- a) Mechanical room(s).
- **b)** Hallway outside bedrooms.
- **c)** Garage. Provide an outlet in the ceiling of the garage for garage door opener. Refer to Part 12 for requirements.

## 14.13 SPECIAL OUTLETS

Provide 240 V electric outlets for electric dryer. Provide 240 V electric outlet for electric range. Provide power for miscellaneous loads of range.

## **14.14 WIRING**

Maximum use shall be made of nonmetallic sheathed cable for branch circuit wiring, and of service entrance cable for heavy-duty interior circuits and for service entrance conductors. Installed conductors in conduit shall be used only where specifically required by the NEC.

#### 14.15 BRANCH CIRCUIT CONDUCTORS

Branch circuit conductors and over current devices shall be as rated by NEC. A minimum of two spare 20-amp circuits shall be provided in the panel for each housing unit. Individual circuits shall be provided for the washer, dryer (with receptacles located behind the washer and dryer), dishwasher, garbage disposal, freezer, furnace or air handling unit, and air conditioning unit. Two utility circuits (20 amp) shall be provided in the kitchen area for the convenience duplex outlets for small appliances serving the kitchen, dining area, and family room area.

## 14.16 COORDINATION OF SWITCH PLATES AND OUTLET PLATES

The Contractor shall gang switches and outlets (electrical, telephone, data, cable) where possible and logical. Multiple individual switch boxes/plates or multiple individual outlet boxes/plates within a few inches of one another are very desirable.

### 14.17 UNIT DESIGN – ELECTRICAL CHECKLIST

□ For each different unit provided, submit documentation in accordance with Section 00110, "Tab 7 Housing Unit Concept Design – Submittal Requirements," including CONSTRUCTION MATERIALS, PRODUCTS, EQUIPMENT AND SYSTEMS work sheets required for the .key interior lighting fixtures.

#### SECTION 01100

#### GENERAL

#### PART 1 GENERAL

### 1.1 INQUIRIES

Pursuant to SECTION 00100 paragraph titled "Instructions to Offerors--Competitive Acquisition", any inquiries regarding this Invitation, before bids are opened, should be addressed to the District Engineer, Kansas City District, Corps of Engineers, 700 Federal Building, Kansas City, Missouri 64106, ATTN: Mr. Richard Whitsell. Inquiries for which oral explanation or advice on the plans and specifications will suffice may be referred to Mr. Whitsell by calling Area Code 816-983-3465. Telephone calls concerning the mailing of plans and specifications should be made to Contracting Division at Area Code 816-983-3975. Collect telephone calls will not be accepted. (KCDO APR 84)

#### 1.2 LOCATION

The site of the work is at Whiteman Air Force Base, MO, located approximately 60 miles southeast of Kansas City, Missouri.

#### 1.3 SUPERINTENDENCE OF SUBCONTRACTORS

- (a) The Contractor shall be required to furnish the following:
- (1) If more than 50% and less than 70% of the value of the contract work is subcontracted, one superintendent shall be provided at the site and on the Contractor's payroll to be responsible for coordinating, directing, inspecting and expediting the subcontract work.
- (2) If 70% or more of the value of the work is subcontracted, the Contractor shall be required to furnish two such superintendents to be responsible for coordinating, directing, inspecting and expediting the subcontract work.
- (b) If the Contracting Officer, at any time after 50% of the subcontracted work has been completed, finds that satisfactory progress is being made, he may waive all or part of the above requirement for additional superintendence subject to the right of the Contracting Officer to reinstate such requirement if at any time during the progress of the remaining work he finds that satisfactory progress is not being made.

#### 1.4 COORDINATION WITH UTILITIES

The Contractor shall be responsible for coordinating his work with the Base Utilities (CEOI), telephone company, or any other commercial utility that may be affected by his/her activities. Any cost in connection with removal and replacement of these utilities, to or on the building, or related equipment, shall be borne by the Contractor.

## 1.5 WORK DELAYS

The Contractor shall anticipate work delays of up to ten (10) calendar days for each calendar year for each Task Order issued during the contract period due to Whiteman AFB operations and activities. This time is included

in the completion time stated. The Contractor shall be notified, in writing, seventy-two (72) hours in advance of these interruptions, except in cases of national security. The time stated for completion shall include final cleanup of the premises. The Contracting Officer will provide 48 hours notice to the Contractor prior to the work delay.

#### 1.6 EMERGENCY OUTAGES

The Contractor shall notify the Contracting Officer immediately when an emergency outage of a utility occurs due to Contractor cutting or damaging the utility. No outage shall exceed four (4) hours in duration. The Contractor shall bear the cost for all repairs. The following list of contacts shall also be informed when an outage occurs.

SECURITY SENSORS	509 SFS/SPOSS
	2154 CS/SCLGC
PHONE LINES COMMERCIAL	509 CS
SECURITY	509 CS/SCLGC
FIRE ALARMS	509 CES/DEF
POWER LINES COMMERCIAL	509 CS
SECURITY	509 SFS/SPOS
FIRE ALARMS	509 CES/DEF

#### 1.7 APPLICATION OF WAGE RATES

The inclusion of the Davis-Bacon Act General Wage Decision or the Service Contract Act Wage Determination in the solicitation is a statutory requirement. It is not a representation by the U.S. Army Corps of Engineers that any specific work task can be performed by any specific trade. Which work tasks can be performed by what trades depends on and is determined by the prevailing area practice for the local area where the contract is being performed. It is the sole responsibility of the offeror to determine and comply with the prevailing area practice. Inquiries regarding a prevailing area practice should be directed to the Corps of Engineers, Contractor Industrial Relations Specialist (telephone number 816-983-3723) or to the Department of Labor Regional Wage and Hour Division.

Application of wage rates and fringe benefits: For the application of the wage rates and fringe benefits contained in the Decisions of the Secretary of Labor, attached to and a part of this contract, all work required within 5 feet outside building lines shall be considered Residential Construction. All other construction not defined herein as Residential Construction shall be considered Heavy Construction.

#### 1.8 PAYMENTS TO SUBCONTRACTORS

The Contractor's attention is directed to CONTRACT CLAUSE titled "Payment Under Fixed-Price Construction Contracts." In addition to the requirements set forth in the referenced paragraph, the Government will reimburse the Contractor, upon request, for amount of premiums paid by the subcontractors for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor furnishes evidence of full payment to the surety.

## 1.9 PAYMENTS TO CONTRACTOR (KCD MAY 90 - FORMERLY FAR 52.2/9101(a))

The following is an example of a Contractor's release of claims clauses required to comply with the provisions of paragraph (h) of the CONTRACT CLAUSE titled "Payments Under Fixed-Price Construction Contracts":

#### RELEASE OF CLAIMS

The undersigned Contractor under contract dated,	2000,
between the United States of America and said Contractor for the	
, in accordance with pa	ıragraph
(h) of the CONTRACT CLAUSE titled "Payments Under Fixed-Price Const	ruction
Contracts" of said contract, hereby releases the United States, its	3
officers, agents, and employees from any and all claims arising und	ler or by
virtue of said contract or any modification or change thereof excep	ot with
respect to those claims, if any, listed below:	

(Here itemize claims and amounts due.)

#### 1.10 PROSPECTIVE CONTRACTOR RESPONSIBILITY

Each bidder shall furnish, within 3 calendar days after receipt of request therefor, data which will show the bidder's ability to perform the work or services required by this Invitation for Bids. Such data shall include as a minimum: Bank certification of financial capability, or a financial statement not over 60 days old, which will be treated as confidential (if over 60 days old, a certificate shall be attached thereto stating that the financial condition is substantially the same or, if not the same, the changes that have taken place); names of commercial and financial reporting agencies from whom credit reports may be obtained; trade creditors; name and address of bonding company; business and construction experience; past record of performance of Government contracts; and construction plant and equipment available for this job, with resume of work in progress or other data that will assure that the bidder is in a position to perform the work within the time specified.

In addition, if the bid exceeds \$1,000,000, the bidder shall furnish upon request, a certified statement listing:

- (a) Each contract awarded to him within the preceding three-month period exceeding \$1,000,000 in value with brief description of the contract.
- (b) Each contract awarded to him within the preceding three-year period not already physically completed and exceeding \$5,000,000 in value with brief description of the contract.
- (c) If the prospective Contractor is a joint venture, each joint venture member will be required to submit the above defined certification. There shall also be furnished any other available information which will serve to substantiate the bidder's qualifications as a responsible prospective Contractor. (KCD APR 84)

#### 1.11 VERIFICATION OF CONDITIONS

The Contractor shall be specifically responsible for the coordination and proper relation of work to the site and to the work of all trades. It is recommended that the Offeror visit the site and thoroughly familiarize himself/herself with all details of the work and working conditions prior to submission of an Offer. Since measurement to existing hidden structural members, etc., often cannot be physically determined, all dimensions shown on the drawings are based on "as-built" record drawings and, to the extent possible, accurately represent existing conditions; however, there may be some variance between existing conditions and contract drawings. The Contractor is responsible for verifying all dimensions and for reporting to

the Contracting Officer or his/her designated representative any discrepancies that may affect performance of the work represented by contract drawings and specifications. Should the contract document lack details showing individual fittings, connectors, anchors, etc., that are no more than are normally provided as standard construction trade practice, these appurtenances shall be considered to be specified as intended for a complete and usable facility, and shall be included in the proposal.

#### 1.12 PERFORMANCE OF WORK BY CONTRACTOR

Bidder's attention is directed to SPECIAL CLAUSE titled "Performance of Work by Contractor." The successful bidder will be required to furnish the Contracting Officer, a description of the work which he will perform with his own organization (e.g., earthwork, paving, etc.), the percentage of the total work this represents, and the estimated cost thereof. Such description of work to be performed by the Contractor's own organization shall be furnished to the Contracting Officer within 10 days after award of the contract.

#### 1.13 LABORATORY AND TESTING FACILITIES

The Contractor shall provide and maintain all measuring and testing devices, laboratory equipment, instruments, transportation, and supplies necessary to accomplish the required testing. All measuring and testing devices shall be calibrated at established intervals against certified standards. The Contractor's measuring and testing equipment shall be made available for use by the Government for verification of their accuracy and condition as well as for any inspection or test desired pursuant to the CONTRACT CLAUSE titled "Inspection of Construction." The location of the laboratory shall be convenient to the site such that test results are available prior to proceeding with the next sequential phase of the work. (KCD)

## 1.14 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

- (a) This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE titled "Default: (Fixed Price Construction)." In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:
- (1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.
- (2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.
- b) The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities for the duration of the project.

Note: After the original contract completion date has passed, adverse weather that causes delay for the completion of the project will be granted day-for-day without deducting anticipated adverse weather delay

days.

#### MONTHLY ANTICIPATED ADVERSE WEATHER DELAY

#### WORK DAYS BASED ON (5) DAY WORK WEEK

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(10)	(9)	(9)	(8)	(7)	(7)	(7)	(5)	(6)	(5)	(7)	(8)

- (c) Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor shall record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical path activities for 50 percent or more of the Contractor's scheduled work day.
  - \* Monthly anticipated weather delays shall be adjusted proportionally if work is performed in a work week with greater than or less than a five-day work week. The following formula shall be used to adjust the monthly anticipated weather delays:

adjusted monthly anticipated weather delays =  $\bf A$  multiplied by ( $\bf B$  divided by  $\bf C$ ); where:

- ${\bf A}$  = The monthly anticipated adverse weather delay for a particular month based on a five-day work week.
- ${f B}$  = The actual average number of days worked per week during that particular month.
  - C = The number five (5).

eg., If the monthly anticipated adverse weather delay for January based on a five day work week is 10 days, but the Contractor actually worked an average of a six-day work week for that month, the monthly anticipated weather delay would be adjusted by applying the above formula as follows:  $10 \times (6/5) = 12$  days

#### 14.1 Weather-related Base Closure

Occasionally, it is necessary to require either early release of Whiteman AFB personnel, their late reporting or even total base closure when weather conditions make normal travel unsafe. When weather conditions cause one of the above situations, Contractor personnel will be denied access to the base, unless they have been notified their contract service has been determined essential. Denied access in these situations will not result in additional costs to the Government.

## 14.2 Weather Information Sources

For your convenience some of the following radio and television stations broadcast and monitor Whiteman AFB closing and late reporting information: WDAF (610 AM), KMBZ (980 AM), KSIS (1050 AM), KDKD (1280 AM/95.3 FM), KOKO (1450 AM), KDRO (1490 AM), KLRQ (96.1 FM), KPRS (103.3 FM), KBEQ (104.0 FM), KXKX (105.7 FM), and KMBC (TV CH 9).

#### 1.15 WORKING HOURS

Normal work hours at Whiteman AFB are 7:30 A.M. through 4:30 P.M., Monday through Friday. Except work will not be permitted on weekends and Federal

holidays. Work to be accomplished at other than the above hours shall require approval of the Contracting officer. In unusual circumstances, such as when utility turn-off is required for an extended period of time, authorization for weekend or holiday work may be requested from the Contracting Officer; these instances must be coordinated well in advance, in writing. Likewise, utility turn-off of short duration or work which will disrupt normal operations or traffic flow must be scheduled at least 3 working days in advance and may require schedule changes to ensure that safety is maintained. If the work being accomplished by the Contractor requires a Government inspector and/or escort, the Contractor is required to pay the inspector's and/or escort's wage at the rate and step for which the Government employee is paid by the Government.

## 1.16 REQUIRED INSURANCE SCHEDULE

In accordance with CONTRACT CLAUSE titled "Insurance - Work On A Government Installation," the Contractor shall procure and maintain during the entire period of his performance under this contract the following minimum insurance.

Type Amount

Workmen's Compensation coverage complying with applicable State Statute

Employers' Liability minimum amount of \$100,000.00

General Liability on minimum limits of \$500,000 per Comprehensive Form of Policy occurrence for bodily injury which includes, but is not limited to, insurance for

all work required herein

Comprehensive Automobile minimum limits of \$200,000 per Liability person and \$500,000 per occurrence for bodily injury, and \$20,000 per occurrence for property damage

(End of clause)

## 1.17 INTERRUPTIONS TO UTILITY SERVICES

A schedule showing the approximate times of interruptions of utility services and roads shall be submitted approximately 30 days in advance of interrupting services to make connections. Where it is necessary to interrupt services to make connections and the period of interruption will last more than 2 hours, the connections shall be performed on Saturday or Sunday, unless otherwise approved by the Contracting Officer. Final arrangements shall be made with the Contracting Officer at least 72 hours in advance of the scheduled times of interruptions.

### 1.18 CONTRACTOR-FURNISHED EQUIPMENT DATA

At or before 30 days prior to final inspection and acceptance of the work, the Contractor shall submit the data mentioned in the following subclauses.

(1) Equipment List. An itemized equipment list showing unit retail value and nameplate data including serial number, model number, size, manufacturer, etc., for all Contractor-furnished items of mechanical

equipment, electrical equipment, and fire protection systems installed under this contract.

- (2) Guarantees. A list of all equipment items which are specified to be guaranteed accompanied by a copy of each specific guarantee therefor. For each specific guaranteed item, a name, address, and telephone number shall be shown on the list for subcontractor who installed equipment, equipment supplier or distributor and equipment manufacturer. The completion date of the guarantee period shall correspond to the applicable specification requirements for each guaranteed item.
- (3) Warranty Service Calls. The Contractor shall furnish to the Contracting Officer the names of local service representatives and/or Contractors that are available for warranty service calls and who will respond to a call within the time periods as follows: 4 hours for heating, air-conditioning, refrigeration, air supply and distribution, and critical electrical service systems and food service equipment, and 24 hours for all other systems. The names, addresses, and telephone numbers for day, night, weekend, and holiday service responses shall be furnished to the Contracting Officer and also posted at a conspicuous location in each mechanical and electrical room or close to the unit.

## 1.19 DATE OF SAFETY AND HEALTH REQUIREMENTS MANUAL (EM 385-1-1)

- (a) The date of the U.S. Army Corps of Engineers Safety and Health Requirements Manual in effect on the date of this solicitation is 3 September 1996. See Section 00700, Contract Clause titled "Accident Prevention."
- (b) Section 06.I of EM 385-1-1 is deleted. Job hazard analysis for confined space entry procedures is still required, as per 01.A.09 of EM 385-1-1. OSHA Standards 29 CFR 1910.146 or 29 CFR 1926 shall apply.
- (c) Before initiation of work at the job site, an accident prevention plan, written by the prime contractor for the specific work and hazards of the contract and implementing in detail the pertinent requirements of EM 385-1-1, will be reviewed and found acceptable by designated Government personnel.

## 1.20 COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

The Contractor shall comply with OSHA standards as well as the most current edition of the Corps of Engineers General Safety Requirements Manual (EM 385-1-1). The OSHA standards are subject to change and such changes may affect the Contractor in his performance under the contract. It is the Contractor's responsibility to know such changes and effective dates of changes.

#### 1.21 CONSTRUCTION EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE

Whenever a modification or equitable adjustment of contract price is required, the Contractor's cost proposal for equipment ownership and operating expenses shall be as set forth in SPECIAL CLAUSE titled "Equipment Ownership and Operating Expense Schedule." A copy of EP 1110-1-8 "Construction Equipment Ownership and Operating Expense Schedule" dated August 1995 can be ordered from the Government Printing Office (GPO) by calling Telephone No. 202-512-1800.

#### 1.22 SHOP DRAWINGS

The Contractor's attention is directed to clause "Specifications and Drawings for Construction" of the Contract Clauses.

## 1.23 SUBMITTALS

- (a) Submittal Procedures. See Division One SECTION: SUBMITTAL PROCEDURES.
- (b) Shop Drawings shall be submitted in ample time to secure approval prior to the time the items covered thereby are to be delivered to the site. ENG Form 4025 shall be used for the transmittal of shop drawings. Unless otherwise specified, shop drawings shall be submitted not less than 30 days before commencement of fabrication of fabricated items and not less than 15 days before delivery of standard stock manufactured items. Where materials are stock with the manufacturer, catalog data, including specifications and full descriptive matter, may be submitted as shop drawings. When catalog includes nonapplicable data, the applicable data shall be clearly designated and identified by item number, item name, and name of manufacturer. Shop drawings submitted (including initial and final submittals) shall be reproductions on high quality paper with clear and legible print. Drawings shall generally be bordered a minimum of one inch and trimmed to neat lines and unless otherwise specified, the minimum scale shall be 3/8-inch to the foot. Shop drawings quality will be subject to approval. Each shop drawing, including catalog data, shall be identified with a title block including the name of Contractor, contract number, name and location of project, and name of item of work or structure to which the shop drawing applies. Material fabricated or delivered to the site before approved shop drawings have been returned to the Contractor will be subject to rejection. NO CONSTRUCTION OR INSTALLATION SHALL BE DONE FOR ANY ITEM REQUIRING SHOP DRAWINGS, UNTIL ALL SHOP DRAWINGS FOR THAT ITEM HAVE BEEN APPROVED.
- (c) As-Built Shop Drawings: Upon completion of the work under this contract, the Contractor shall furnish five complete sets of prints or one complete set of reproducibles of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted. The quality of the reproducibles and prints is subject to approval.
- (d) As-Built Drawings: The Contractor shall maintain three separate sets of red-lined, full scale, as-built construction drawings marked up to fully indicate as-built conditions. These drawings shall be maintained in a current condition at all times until completion of the work, and shall be available for review by Government personnel at all times. All variations from the contract drawings, for whatever reason, including those occasioned by modifications, optional materials, and the required coordination between trades, shall be indicated. These variations shall be shown in the same general detail utilized in the contract drawings. In addition, the Contractor shall indicate on the As-Built Drawings, the brand-name, description, location, and quantity of any and all materials used which contain asbestos. The Contractor shall also be responsible for updating the Government-furnished CADD files to reflect the current as-built conditions throughout the duration of the project. The updated CADD design files shall be maintained in the Intergraph Microstation format consistent with the graphic standards established in the CADD contract drawings provided by the Government. The Contractor will be provided a copy of the Tri-Service CADD standards to facilitate his efforts in the maintenance of design files. The updated CADD files shall be reviewed by the Government on a monthly basis during the progress payment evaluation. The Contractor

shall be prepared to demonstrate the status of the updated CADD files in his on-site office. The as-built utility drawings shall show locations and elevations of all underground new utilities and existing utilities encountered, including dimensions from permanent structures and/or survey locations. The submittal requirements for as-built utility drawings shall be shown as separate activities on the Contractor-prepared network analysis. Upon completion of the work, the marked-up drawings and the updated CADD files shall be furnished to the Contracting Officer on CD. In multiphased construction where portions of a system are to be turned over to the user prior to completion of the project, the marked-up drawings for that portion shall be furnished to the Contracting Officer at that time. (MRD ltr 30 Oct 70 and KCD 8 Apr 91)

- (e) CADD Files: The Government will provide to the Contractor, within 30 calendar days after Notice of Award, copies of the CADD computer files of the contract drawings for the production of as-built drawings. These files will be in Intergraph Microstation format. The Government provides no warranty, expressed or implied, of the CADD computer files. The Contractor shall assume all responsibility to verify the CADD drawing files. The Contractor will not utilize the CADD drawing computer files to resolve dimensional or other discrepancies. The Government will not guarantee the measurable accuracy of the CADD drawing computer files.
- (f) Purchase Orders: Each purchase order issued by the Contractor or his subcontractors for materials and equipment to be incorporated into the project, shall be maintained on file at the Contractor's field office for inspection and review by Government representatives. Each purchase order shall (1) be clearly identified with applicable DA contract number, (2) carry an identifying number, (3) be in sufficient detail to identify the material being purchased, (4) indicate a definite delivery date, and (5) display the DMS priority rating. At the option of the Contractor, the copies of the purchase orders may or may not indicate the price of the articles purchased. (MRD Ltr 22 Oct 74)

## (g) Color Boards:

- 1. The Contractor shall submit a minimum of three (3) complete sets of color boards within 120 calendar days of receipt of Notice to Proceed. Construction color boards shall be submitted in a 3-ring notebook binder with all materials securely mounted on rigid 8-1/2 by 11-inch presentation (mat) board, with a maximum spread of 25-1/2 by 33 inches for foldouts, clearly coded regarding location of materials in the facility.
- 2. An index shall be provided listing pertinent contract specifications and drawings for each sample and any proposed substitutions or variances shall be so designated. The Contractor shall also certify, in writing, that all submittal items technically comply with the project specifications.
- 3. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract as specified on the Interior Room Finish Schedule, the Exterior Finish Schedule and Interior Finish Materials Legend located in the Contract Drawings, and the sample requirements of the submittal registers. All materials must be labeled with the manufacturer's name, pattern and color reference. Patterned material samples (i.e., carpet) must be of sufficient size to enable evaluation of the pattern. Samples shall be keyed or coded to match any key or code system in the Contract Drawings.
- 4. The Contractor shall express mail a minimum of three (3) copies of the

color boards to the Contracting Officer. The Contracting Officer will forward one copy of the colorboards to CENWK-EC-D for review and concurrence. Concurrence or comments will be provided not later than 45 calendar days after receipt of the submittal. This paragraph does not cover the quality of finishing materials. The quality, physical requirements, and method of installation shall be submitted with the appropriate shop drawings. The Contractor shall not submit any of the above requirements with the color boards. Specific locations where the various materials are required are shown on the drawings.

### 1.24 SPECIAL REFERENCES

- (a) Shop Drawings. Bidder's attention is directed to SPECIAL CLAUSE titled "Shop Drawings." The basic requirements for Shop Drawings are set forth in the CONTRACT CLAUSES and SPECIAL CLAUSES.
- (b) Approved Equal. Bidder's attention is directed to SPECIAL CLAUSE titled "Approved Equal."
- (c) Payment to Subcontractors. Bidder's attention is directed to SPECIAL CLAUSE titled "Payments to Subcontractors."

#### 1.25 DIFFERENCES IN DRAWINGS

In addition to the provisions of CONTRACT CLAUSE paragraph "Specifications and Drawings for Construction," the structural drawings shall govern in cases where they differ from the architectural drawings.

## 1.26 INSTALLATION OF EQUIPMENT

These Specifications and Contract Drawings represent minimum Government requirements. Any additional requirements peculiar to the equipment manufacturer, which must be incorporated before the manufacturer shall furnish his standard guarantee, shall be incorporated into the work at no additional cost to the Government. The finished work shall be free from material and installation defects.

#### 1.27 MATERIALS

All materials furnished under this contract shall be free from defects which may cause malfunction or unsightly appearance. Only new and unused materials of standard manufacture shall be furnished. Materials and fabrication shall be predicated upon requirements of laws, codes, or standards specified herein or commonly recognized as applicable to work required under this contract.

#### 1.28 DAMAGE TO WORK (1966 MAR OCE)

The responsibility for damage to any part of the permanent work shall be as set forth in the CONTRACT CLAUSE titled "Permits and Responsibilities." However, if, in the judgment of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor will make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices

applicable to any part of such work an equitable adjustment pursuant to CONTRACT CLAUSE titled, "Changes," of the contract, will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense, regardless of the cause of such damage.

### 1.29 WORK ADJACENT TO ROADS AND HIGHWAYS

Where the construction work is on or adjacent to, or involves hauling over public or private roads, streets, or highways, all herein referred to as "roads," the said roads shall, except as otherwise specified or directed, be kept open for traffic at all times during the construction period. Further, the Contractor shall, during said construction, provide, erect and maintain warning signs, lanterns or torches or other safety devices and, when necessary, provide flagmen for protection of traffic to the satisfaction of the Contracting Officer and local authorities. The Contractor shall keep the right-of-way of the roads free of debris that might be caused to accumulate thereon by his operations, and upon completion of the work, shall clean up the said roads and repair any damage to the roads occasioned by his operations under this contract to the satisfaction of the Contracting Officer and local authorities having jurisdiction. The drainage from the roads shall not be obstructed by the construction work. The Contractor shall be responsible for obtaining and paying for all permits required for operation on all roads.

## 1.30 APPROVED EQUAL

The drawings and the TECHNICAL PROVISIONS of these specifications may, in some instances, refer to certain items of equipment, material, or article by trade name. References of this type shall not be construed as limiting competition, but shall be regarded as establishing a standard of quality. In this respect, the Contractor's attention is directed to CONTRACT CLAUSE titled "Material and Workmanship."

#### 1.31 SCHEDULE OF WORK

The Contractor's attention is directed to CONTRACT CLAUSE titled "Schedule for Construction Contracts," wherein if, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer.

# 1.32 UPKEEP OF ROADWAY AREAS WITHIN A MILITARY INSTALLATION WHICH THE CONTRACTOR USES

In addition to the requirements in CONTRACT CLAUSE titled "Operations and Storage Areas," the Contractor shall comply with the following requirements: Where the construction work is on or adjacent to, or involves hauling over public roads, streets, or highways located on a military installation, all herein referred to as "roads," the said roads shall except as otherwise specified or directed, be kept open for traffic at all times during the construction period. The Contractor shall keep the roads including adjacent construction site free of debris including litter, waste construction material, mud etc., that might be caused to accumulate thereon by his operations, and upon completion of the work, shall clean up the said roads and construction site and repair any damage occasioned with

his operations under this contract to the satisfaction of the Contracting Officer. The drainage from the roads shall not be obstructed by the construction work.

## 1.33 PROTECTION OF UTILITY LINES

- (a) It shall be the Contractor's responsibility to protect all existing utility lines from damage during excavation for utilities systems. Any damage resulting to existing utility systems shall be repaired by the Contractor, to the satisfaction of the contracting officer, at no additional cost to the Government.
- (b) All requests for access and/or locations must be made through the Contracting Officer's Representative (COR) or Resident Engineer. The Director of Public Works will work directly with the Resident Engineer to provide timely information to the Contractor.

### 1.34 MODIFICATIONS PRIOR TO DATE SET FOR OPENING BIDS

The right is reserved, as the interest of the Government may require, to revise or amend the specifications or drawings or both prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. If the revisions and amendments are of a nature which requires material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the issuing officer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids. (KCD APR 84)

#### 1.35 SECURITY MEASURES FOR STORAGE OF EXPLOSIVES ONSITE

When explosives are stored on the project site the following security measures shall be followed which are in accordance with the requirements contained in the Corps of Engineers Manual, EM 385-1-1, dated April 1981, as amended, Part II of the Federal Safety and Health Regulations; Metal and Nonmetallic Mine Safety, Title 30, Code of Federal Regulations, and Commerce in Explosives, Title 26, Code of Federal Regulations.

- (a) The explosive storage area shall be provided with perimeter fence, chain link or other approved type, not less than 6 feet in height plus extension arms with three strands of barbed wire. The storage area shall be provided with a gate which shall be secured with a chain and padlock. The gate shall be locked at all times except when explosives are being removed or placed in the area.
- (b) Minimum distance between a storage magazine and the perimeter fence shall be 25 feet.
- (c) The area outside the perimeter fence for a minimum distance of 10 feet and the area inside the perimeter fence shall be kept clear of vegetation and all combustible matter.
- (d) The storage area shall be well lighted during the hours of darkness. (MRD Ltr, 16 May 73, HST 11, 30, 31 23 Apr 75)

## 1.36 UNEXPECTED HAZARDOUS SUBSTANCES

In the event that suspected hazardous substances are revealed during construction activities, all such construction activities in the immediate area shall be immediately suspended. Hazardous substances for purposes of this specification only, shall be defined as CERCLA hazardous substances, infectious or radioactive wastes, asbestos or oil. The Contractor shall leave the materials undisturbed and shall immediately report the find to the Contracting Officer's Representative (COR) so that proper authorities can be notified. The Contractor shall not resume construction activities in the vicinity of the suspected hazardous substances until written clearance is received from the COR. Identification and removal of any such materials will be conducted in accordance with all Federal, state and local environmental laws and regulations according to the CONTRACT CLAUSE titled "Differing Site Conditions."

# 1.37 UNEXPECTED DISCOVERY OF ASBESTOS ON CONSTRUCTION (RENOVATION AND DEMOLITION)

The buildings and areas to be renovated or demolished have been surveyed for the presence of asbestos-containing materials. This survey is not a warranty that asbestos-containing materials are either not present or limited to the amounts found in the survey. Should unexpected asbestos-containing material be encountered, the Contractor shall promptly, and before the conditions or the substance encountered is disturbed, give a written notice to the Contracting Officer of the suspected asbestos-containing material conditions encountered. As directed by tee Contracting Officer, the Contractor shall remove and dispose of any and all asbestos-containing material as necessary to accomplish the required work which shall be performed in accordance with all pertinent local, state, and federal laws. An equitable adjustment will be made to the Contractor in accordance with the CONTRACT CLAUSE entitled "Changes", for the additional work directed by the Contracting Officer.

#### 1.38 SURVEY MARKERS

Reference is made to CONTRACT CLAUSE titled "Permits and Responsibilities", Chapter 60 of the Missouri Revised Statutes 1969, and rules titled "Maintenance of the Original US Public Land Survey Corners" adopted by the Division of Geology and Land Survey, Missouri Department of Natural Resources. The Contractor shall be responsible for removing and relocating survey markers. Relocation shall be performed by a professional registered Land Surveyor.

#### 1.39 DEMOLITION

Disposal of demolition waste shall be in accordance with all applicable Federal, State and local regulations, including "Chapter 260, RSMO" of the "Missouri Department of Natural Resources."

#### 1.40 EXCAVATION NOTIFICATION

Prior to any excavation on either public or private properties, Missouri law requires that you notify all owners and operators of underground facilities in your dig site. Missouri One Call System (MOCS) can help you comply with the law; "Chapter 319, RSMO" of the "Missouri Department of Natural Resources," by calling this one toll-free number 1-800-344-7483.

## 1.41 ENCOUNTERING EXISTING UNDERGROUND UTILITIES

During any excavation activity, existing underground utilities encountered

shall be immediately reported to the Contracting Officer.

Within 48 hours of encountering underground utilities, the Contractor shall submit to Contracting Officer a marked-up copy of contract drawing that best represents the location, general description and approximate depth of the utilities below finished grade.

Also, the Contractor shall incorporate the above information in required marked-up full scale contract drawing indicating as-built conditions in accordance with all contract provisions pertaining to "As-Built Drawings."

#### 1.42 DAILY WORK SCHEDULES

In order to closely coordinate work under this contract, the Contractor shall prepare for and attend a weekly coordination meeting with the Contracting Officer and Using Service at which time the Contractor shall submit for coordination and approval, his proposed daily work schedule for the next 2-week period. Required temporary utility services, time and duration of interruptions, road cuts, and repairs requiring traffic control, and protection of adjoining areas shall be included with the Contractor's proposed 2-week work schedule. Coordination action by the Contracting Officer relative to these schedules will be accomplished during these weekly meetings.

#### 1.43 SITE FENCING AND MOWING

The Contractor shall provide orange snow fencing around the entire work site; all site storage areas are considered a part of the work site. When grass/weeds exceed six inches in height, all areas contained by orange snow fencing shall be mowed. Snow fencing on pavement shall be supported by weighted orange barrels.

#### 1.44 CLEANLINESS OF PAVED SURFACES

When paved surfaces are jointly used by the Air Force and Contractor, the Contractor shall keep all paved surfaces, such as runways, taxiways, and hardstands, clean at all times and, specifically, free from small stones which might damage aircraft propellers or jet aircraft.

## 1.45 WORK ON WEEKENDS OR HOLIDAYS

If the Contractor intends to work on weekends or holidays that will require the use of the south gate, the Contractor shall notify the Security Police and the Resident Office by noon the Thursday prior to the weekend or 48 hours prior to a holiday.

#### 1.46 UTILITY MARKING

The Contractor shall be required at the request of other contractors working in the area to flag the utilities being installed on this contract within 14 days of the request by the other contractor working in the area.

#### 1.47 BASE REGULATIONS

All activities of the Contractor and his/her employees, and of all subcontractors and their employees while on the base, shall be conducted in strict accordance with all base regulations, including those of the fire marshal.

1.47.1 BASE POLICY FOR THE OPERATION OF ALL HYDRANTS AND VALVES ON THE BASE WATER DISTRIBUTION SYSTEM

The following is the base policy for the operation of all hydrants and valves on the base water distribution system:

- a. The fire alarm communication center will be immediately notified at 4507 or 4508, of out-of-service hydrants, sprinkler system, stand pipes, etc. The alarm room will also be notified when hydrants are returned to service.
- b. Civil Engineering personnel are responsible for operation of all valves and are the only one to open or close these valves. In an emergency (water main break) a Contractor may close a valve and notify the Fire Department at 4507 or 4508 and Mains Maintenance at 6357 immediately.
- c. When fire hydrants are out-of-service the Fire Department will immediately place a metal placard 12 inches in diameter with waterproof white letters on a red background reading "OUT-OF-SERVICE". The placards will be placed in a way that identifies hydrants from approaching direction.
- d. When fire hydrants are placed back in service, the Fire Department will immediately remove placards.
- e. Every effort will be made to return hydrants to service as soon as possible. Hydrants awaiting parts will be assigned an emergency work order. When hydrants are shut down due to construction, call the Fire Department as listed above.
- f. The use of fire hydrants by other than fire protection personnel will be coordinated and approved by the Base Fire Chief. Such use will not render the hydrant inoperative for fire protection operations.
- 1.47.2 POLICY FOR STORAGE OF HAZARDOUS MATERIALS ON CONSTRUCTION SITES

The following is the policy for storage of hazardous materials on construction sites located at Whiteman AFB MO.

- a. Definition of hazardous materials is any substance which, by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful, and is likely to cause death injury.
- b. Hazardous material will not be stored in Government facilities, without special authorization from base. Contact point will be the Fire Department at extension 6080.
- c. Each construction site shall have a hazardous material storage area. This area will be the only location that hazardous material shall be stored on a construction site. Exceptions must have prior written approval from the base. Contact point will be the Fire Department at extension 6080.
- d. Number every trailer, building and shed with a number at least 6 inches by 4 inches; this number will correspond with the numbers listed below in item e.1.
- e. The Contractor will provide an emergency folder that will be kept on-site and up-to-date at all times (on the injury board). This folder shall contain:

- (1) Construction site map identifying every road, building, trailer, and shed on site by number, as well as hazardous material storage location.
- (2) A copy of every MSDS (material safety data sheet) with amount and location of all hazardous material on site.
- f. The Contractor will also provide a copy of each map and MSDS to the Base Fire Department, Building 34 (Dispatch Office) immediately upon delivery of all hazardous material to construction site.

### 1.47.3 SPECIAL SAFETY REQUIREMENTS

The Contractor shall comply with Air Force and local fire regulations and NFPA 241-1986 "Safeguarding Building Construction and Demolition Operations." Fire extinguishers rated and approved by the National Fire Protection Association, of sufficient size, type, and quantity to cope with all known hazards, shall be provided by the Contractor at the construction site during the execution of this contract; the extinguishers shall be removed upon acceptance of the project.

## 1.47.4 Entry to Whiteman Air Force Base

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display identification as may be approved and directed by the Contracting Office. When required by the Contracting Officer the Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project. Whiteman AFB is a closed base pursuant to Sec. 21, Internal Security Act of 1950, 50 U.S.C. 797 and, as such, only those persons granted permission may enter. It is, however, required that control be exercised over Contractor personnel while working on the base. To maintain this control, an Enrty Authorization List (EAL) of all Contractor personnel and Subcontractor's personnel that shall be working under the Contract, must be submitted to the Contracting Officer or his/her designated representative five (5) working days prior to start of work under this contract, in both paper and electronic form. The listing shall include, but not be limited to: Contract Number, Project Number, Employee: Full Name, last six (6) of Social Security number, and Vehicles: year, make, model, license plate number. Subsequent listings of all personell additions or deletions shall be submitted as employees are hired or released. A sample of and EAL is attached at the end of this section. EAL are normally processed on Tuesday and Thursday afternoons. To be processed they need to be received prior to noon on Tuesday or Thursday. Contractor is responsible for collection of Base passes form personeel and subcontractors personell when they longer require enrty to the base. These list normal operating conditions at Whiteman AFB, the contractor shall expect occasional security changes due to Air Force Operations.

## 1.47.5 TRANSPORTATION, HANDLING, AND STORAGE

The Contractor shall coordinate with suppliers and shippers to ensure incoming materials are properly identified with the Contractor's Name, Contract Number and Project Title, and have a designated individual to receive shipments. The Contractor shall provide a telephone and cell phone number of his/her designated individual to receive shipments, in writing, to the Contracting office. No Government furnished covered storage area is available for the Contractor's use. However, the Government shall designate an open storage area and the Contractor may, at his/her own expense, rovide means of covered storage (i.e. trailer(s)). Placement of trailer(s) on base shall be at the direction of the Contracting Officer or his/her designated

representative.

#### 1.48 MISSOURI SALES AND USE TAX

In accordance with FAR Clause 52.229, notice is given that the contract price excludes the Missouri sales tax and compensating (use) tax on all sales of tangible personal property and materials purchased by the Contractor or subcontractors for the construction of projects, including repairing or remodeling facilities, for the United States. In accordance with Section 144.062, RSMo., the Contracting Officer will issue and furnish to the Contractor an exemption certificate (example copy appears at the end of this section) for this project with the Notice to Proceed. The Contractor and the subcontractors will use the exemption certificate for this project in the purchase of supplies, materials and furnishings for incorporation in the project. The Contractor and the subcontractors shall furnish a copy of such certificate to all suppliers/materialmen from whom such purchases are made, and the suppliers shall execute invoices covering the same bearing the number of such certificate. (KCD OC)

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

\* \* \* \* \* \*

#### EXAMPLE

### STATE OF MISSOURI

### PROJECT EXEMPTION CERTIFICATE FOR EXEMPT ENTITY CONSTRUCTION

#### UNITED STATES OF AMERICA

NAME OF EXEMPT ENTITY
ADDRESS
CITY STATE ZIP
TAX IDENTIFICATION NUMBER (None required)
PROJECT IDENTIFICATION NUMBER
PLEASE PROVIDE THE PROJECT LOCATION AND A BRIEF DESCRIPTION BELOW
CONTRACT DATE
CERTIFICATE EXPIRATION DATE

Contractors are required to provide a copy of this project exemption certificate to their vendors.

This project exemption certificate does not allow contractors to purchase machinery, equipment, or tools used in fulfilling this contract, tax exempt.

Suppliers accepting this project exemption certificate are required to render to the contractor invoices bearing the name of the exempt entity and the project identification number.

An exempt entity that fails to revise the expiration date on this certificate as necessary to complete any work required by the contract will be liable for any sales tax determined due as a result of an audit of the contractor.

The Contractor shall provide this project exemption to all subcontractors purchasing construction materials for this project.

SIGNATURE OF AUTHORIZED AGENT

EXHIBIT A

Date

- 1. The following personnel from (Company Name) will need to be added for (Base entry) for (Contract Number) (Contract Name)
- +/- NAME, Last First SSN COMPANY

## VEHICLES:

- +/- Year Make/Model Equipment Type License No Color
- (+) for addition of personal or vehicle; (-) for deletion of personal or vehicle

-- End of Section --

#### SECTION 01312A

## QUALITY CONTROL SYSTEM (QCS) 08/01

#### 1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Import/Export of Data

### 1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

## 1.1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320A, PROJECT SCHEDULE, Section 01330, SUBMITTAL PROCEDURES, and Section 01451A, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

#### 1.2 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on high-density diskettes or CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

### 1.3 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

#### Hardware

IBM-compatible PC with 200 MHz Pentium or higher processor

32+ MB RAM

4 GB hard drive disk space for sole use by the QCS system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

#### Software

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software compatible with MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

## 1.4 RELATED INFORMATION

## 1.4.1 QCS User Guide

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

### 1.4.2 Contractor Quality Control(CQC) Training

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

## 1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the

Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

#### 1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The QCS database typically shall include current data on the following items:

#### 1.6.1 Administration

#### 1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

#### 1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

#### 1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

## 1.6.1.5 Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

## 1.6.1.7 Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

#### 1.6.2 Finances

## 1.6.2.1 Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

### 1.6.2.2 Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

### 1.6.3 Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451A, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

## 1.6.3.1 Daily Contractor Quality Control (CQC) Reports.

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451A, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the Government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

## 1.6.3.2 Deficiency Tracking.

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies

it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

#### 1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

## 1.6.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

#### 1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

## 1.6.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

## 1.6.4 Submittal Management

The Government will provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

## 1.6.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", or Section 01320A, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320A PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

## 1.6.6 Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

#### 1.7 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

## 1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the QCS built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

#### 1.8.1 File Medium

The Contractor shall submit required data on 3-1/2 inch double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

## 1.8.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

## 1.8.3 File Names

The Government will provide the file names to be used by the Contractor with the QCS software.

## 1.9 MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

## 1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

-- End of Section --

#### SECTION 01320A

## PROJECT SCHEDULE 08/01

#### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referenced in the text by basic designation only.

## U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1-1-11

(1995) Progress, Schedules, and Network Analysis Systems

#### 1.2 OUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports.

PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

## 3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel will result in an inability of the Contracting Officer to evaluate Contractor's progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

## 3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the

Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Contracting Officer.

#### 3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in the Precedence Diagram Method (PDM).

## 3.3.2 Level of Detail Required

The Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule:

## 3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Durations are greater than 20 days).

#### 3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, and delivery.

#### 3.3.2.3 Critical Activities

The following activities shall be listed as separate line activities on the Contractor's project schedule:

- a. Submission and approval of mechanical/electrical layout drawings.
- b. Submission and approval of O & M manuals.
- c. Submission and approval of as-built drawings.
- d. Submission and approval of 1354 data and installed equipment lists.
- e. Submission and approval of testing and air balance (TAB).
- f. Submission of TAB specialist design review report.
- g. Submission and approval of fire protection specialist.
- h. Submission and approval of testing and balancing of HVAC plus

commissioning plans and data.

- i. Air and water balance dates.
- j. HVAC commissioning dates.
- k. Controls testing plan.
- 1. Controls testing.
- m. Performance Verification testing.
- n. Other systems testing, if required.
- o. Prefinal inspection.
- p. Correction of punchlist from prefinal inspection.
- q. Final inspection.

#### 3.3.2.4 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

## 3.3.2.5 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code.

## 3.3.2.6 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

## 3.3.2.7 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number. Whenever possible, changes shall be added to the schedule by adding new activities. Existing activities shall not normally be changed to reflect modifications.

#### 3.3.2.8 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item. The bid item for each appropriate activity shall be identified by the Bid Item Code.

#### 3.3.2.9 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

## 3.3.2.10 Category of Work

All Activities shall be identified in the project schedule according to the category of work which best describes the activity. Category of work refers, but is not limited, to the procurement chain of activities including such items as submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing. The category of work for each activity shall be identified by the Category of Work Code.

#### 3.3.2.11 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to, a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

## 3.3.3 Scheduled Project Completion

The schedule interval shall extend from NTP to the contract completion date.

## 3.3.3.1 Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

## 3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

## 3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted in the narrative report at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

#### 3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

## 3.3.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

## 3.3.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

#### 3.3.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

## 3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Program features which calculate one of these parameters from the other shall be disabled.

## 3.3.6 Out-of-Sequence Progress

Activities that have posted progress without all preceding logic being satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case approval of the Contracting Officer. The Contractor shall propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule.

## 3.3.7 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

## 3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data

disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

## 3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days shall be submitted for approval within 30 calendar days after the NTP is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 90 calendar days after NTP.

## 3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 40 calendar days after NTP. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

## 3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

## 3.4.4 Standard Activity Coding Dictionary

The Contractor shall use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used.

#### 3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the preliminary submission, initial submission, and every periodic project schedule update throughout the life of the project:

## 3.5.1 Data Disks

Two data disks containing the project schedule shall be provided. Data on the disks shall adhere to the SDEF format specified in ER 1-1-11, Appendix A.

## 3.5.1.1 File Medium

Required data shall be submitted on  $3.5~{\rm disks}$ , formatted to hold  $1.44~{\rm MB}$  of data, under the MS-DOS Version  $5.~{\rm or}~6.{\rm x}$ , unless otherwise approved by the Contracting Officer.

#### 3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Preliminary, Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the

MS-DOS version used to format the disk.

#### 3.5.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer for approval.

## 3.5.2 Narrative Report

A Narrative Report shall be provided with the preliminary, initial, and each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 3 most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to relay to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through that analysis.

#### 3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

## 3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

## 3.5.4.1 Activity Report

A list of all activities sorted according to activity number.

## 3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number. Preceding and succeeding activities shall include all information listed above in paragraph Schedule Reports. A blank line shall be left between each activity grouping.

## 3.5.4.3 Total Float Report

A list of all incomplete activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates. Completed activities shall not be shown on this report.

## 3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the NTP until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

## 3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission and on monthly schedule update submissions. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

## 3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity number, description, duration, and estimated earned value shall be shown on the diagram.

## 3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

## 3.5.5.3 Critical Path

The critical path shall be clearly shown.

## 3.5.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

#### 3.5.5.5 S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

## 3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

#### 3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

## 3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

#### 3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Contracting Officer. As a minimum, the Contractor shall address the following items on an activity by activity basis during each progress meeting.

#### 3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed .

## 3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations shall be based on Remaining Duration for each activity.

## 3.6.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

## 3.6.3.4 Logic Changes

All logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

## 3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule which does not represent the actual or planned prosecution and progress of the work.

## 3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, or any interim milestone date, the Contractor shall

furnish the following for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

## 3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for a time extension to the contract completion date.

## 3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

- a. A list of affected activities, with their associated project schedule activity number.
  - b. A brief explanation of the causes of the change.
  - c. An analysis of the overall impact of the changes proposed.
  - d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

## 3.7.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

## 3.8 DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless

of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

## 3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --

#### SECTION 01330

## SUBMITTAL PROCEDURES 09/00

#### PART 1 GENERAL

## 1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers and titles as follows:

- SD-01 Preconstruction Submittals
- SD-02 Shop Drawings
- SD-03 Product Data
- SD-04 Samples
- SD-05 Design Data
- SD-06 Test Reports
- SD-07 Certificates
- SD-08 Manufacturer's Instructions
- SD-09 Manufacturer's Field Reports
- SD-10 Operation and Maintenance Data
- SD-11 Closeout Submittals

#### 1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

## 1.2.1 Government Approved

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

## 1.2.2 Information Only

All submittals not requiring Government approval will contain no reviewer classification on the submittal register, and will be for information only. These information only submittals shall be sent directly to the appropriate Area/Resident Engineer's office.

## 1.3 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory.

Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

## 1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. **Caution:** The Contractor is cautioned that for each Contractor's resubmittal required beyond the initial submittal and one resubmittal for corrections required by the Contracting Officer, the Contracting Officer will assess Administrative Deduction in the amount of \$500.00 from the progress payments due the Contractor. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

#### 1.5 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

## PART 2 PRODUCTS (Not used)

#### PART 3 EXECUTION

## 3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

## 3.2 SUBMITTAL REGISTER

At the end of this section is a submittal register showing items of

equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor shall complete and submit the forms to the Contracting Officer for approval within twenty (20) calendar days after the Notice to Proceed. The Contractor shall maintain a submittal register for the project in accordance with Section 01312 RESIDENT MANAGEMENT SYSTEM (RMS).

#### 3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of thirty (30) calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

## 3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

#### 3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

## 3.5.1 Procedures

The Contractor shall submit for approval five (5) copies of all submittals. For all Military projects an additional copy of all submittals (for information only) related to fire protection/detection systems shall be submitted to Base Civil Engineering Office for review by the Fire Chief. The mailing address for these submittals shall be obtained at the preconstruction conference. Items not to be submitted in quintuplicate, such as samples and test cylinders, shall be submitted accompanied by five (5) copies of ENG Form 4025. Items to be sent to the Kansas City District Office shall be sent to EC-DS, addressed as follows, where distribution will be made to the appropriate reviewer:

US Army Engineer District, Kansas City ATTN: EC-DS (Shop Drawing Coordinator) Federal Building, 601 East 12th Street Kansas City, Missouri 64106-2896

## 3.5.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

#### 3.6 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

#### 3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. 4 copies of the submittal will be retained by the Contracting Officer and 2 copies of the submittal will be returned to the Contractor.

## 3.8 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

## 3.9 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR							
(Firm Name)							
Approved							
Approved with corrections as noted on submittal data and/or attached sheets(s).							
SIGNATURE:							
TITLE:							
DATE:							

<sup>--</sup> End of Section --

## SECTION 01332

## SUBMITTALS DURING DESIGN

## **INDEX**

1	GENEF	AL	3
	1.1 SU	MMARY	:
	1.1.1	Section Includes	
	1.1.2	Section Excludes	
		FERENCES	
	1.2.1	The Construction Specifications InstituTe (CSI)	
	1.2.2	Kansas City District CADD Standards Manual	
	1.2.3	WEB Sites	4
	1.3 EN	GLISH UNIT REQUIREMENTS	4
	1.4 DE	FINITIONS	
	1.4.1	Contractor	
	1.4.2	Design	
	1.4.3	Design Drawings	
	1.4.4	Designer	
	1.4.5	Request for Proposal (RFP)	
		ALITY ASSURANCE (SEE SECTIONS 00110 AND 01451)	
		BMISSION OF DESIGN DRAWINGS, SPECIFICATIONS AND DESIGN ANALYSES	
	1.6.1	Design Certification	
	1.6.2	Deviations	
	1.6.3 1.6.4	Field Inspection.	
	1.6.4 1.6.5	Drawings Design Documents	
	1.6.6	Design Reviews	
	1.6.7	Document Packaging	
_			
2	PRODU	JCTS	7
	2.1 MA	ATERIAL REQUIRED FOR 100% FINAL SITE AND 65% HOUSING DESIGN AND 100% FINAL	
		DESIGN SUBMITTAL:	
	2.1.1	Site/Infrastructure	
	2.1.2	Housing Units	
	2.1.3	Specific Mechanical and Plumbing Requirements	
	2.1.4	Specific Electrical Requirements	13
		SIGN ANALYSIS & DESIGN CALCULATIONS	
	2.2.1	Storm Drainage System Calculations	
	2.2.2	Foundation Drainage System Calculations	
	2.2.3	Structural Design Calculations	
	2.2.4	Mechanical Design Analysis	
	2.2.5	Electrical Design Analysis	13
3	EXECU	TION	16
	3.1 DR	AWINGS	16
	3.1.1	Drawings Format	
	3.1.2	Drawings Sequence	
		ECIFICATIONS	
	3.2.1	Division 1 Specification Sections	
	3.2.2	government provided Guide Specifications	
	3.2.3	Format for Project Specifications	
	3.3 CO	NSTRUCTION SUBMITTALS	10

3.3.1	Submittals Register (Form)	19
3.4 DE	SIGN ANALYSES	
3.4.1	Engineering Considerations and Instructions (ECI) for Field Personnel	20
3.4.2	Requests for Information, Meeting Minutes and Comments	21
3.5 DE	SIGN CERTIFICATION	21
3.6 RE	VIEW BY GOVERNMENT AGENCIES	21
3.6.1	Distribution of Design Documents for Conformance Review	21
3.6.2	Review Comments:	26
3.6.3	Using Automated Review Management System:	27
3.6.4	Delays	27
3.6.5	Reproduction (For Construction):	27
3.6.6	Government Design Review and Acceptance	27
3.6.7	DD Form 1354, Transfer and Acceptance of Military Real Property	28
3.7 RE	VISIONS TO THE ACCEPTED DESIGN	28

## **SECTION 01332**

# DESIGN SUBMITTAL REQUIREMENTS (TASK ORDER NO. 1) 9/01

## 1 GENERAL

The contractor shall conduct the design effort considering the entire housing neighborhood development of the land parcel depicted in the Task Order and Community Development Plan. The design will include planning and sizing utilities systems, connecting roadways, trailways, etc sufficient to accommodate the future development indicated in the Task Order for the area. The contractor shall be responsible any additional design effort, or rework required due to undersizing or relocating of infrastructure, that failed to consider the future housing developments for the parcel of land described in the task order. Utility tie in points have been identified in the RFP for this task order and the future anticipated development of the land parcel.

Attachments: Attachment A, Design Certification and Transmittal Letter

DD Form 1354 - Transfer and Acceptance of Military Real Property

Instructions for Preparation of DD Form 1354

#### 1.1 SUMMARY

#### 1.1.1 SECTION INCLUDES

- a. Design: This section includes general requirements for developing and submitting the complete housing project design including preparation of drawings, specifications, design analyses and other design and construction deliverables conforming to the requirements contained in this section. Distribution requirements for design deliverables are also covered in this section.
- b. Construction: This section includes distribution requirements for the construction set of design deliverables and distribution requirements for DD Form 1354 and as-built drawings.

## 1.1.2 SECTION EXCLUDES

This section does not include requirements for construction submittals, which are specified in Section 01330, "Submittal Procedures."

#### 1.2 REFERENCES

The references listed below form a part of this specification to the extent referenced.

## 1.2.1 THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI)

CSI Masterformat Master List of Section Titles and Numbers

## 1.2.2 KANSAS CITY DISTRICT CADD STANDARDS MANUAL

(a) AutoCADD drawings will follow the National CAD Tri-Services standards. File naming convension and special instructions, title block layout will be provided on the Compact Disk with this task order. Also, see Section 01040 AS-BUILT DRAWINGS. The Contractor shall be responsible for furnishing one set of the required CAD software to the contracting officers representative 30 calendar days following the Notice to Proceed (NTP) for design.

## 1.2.3 WEB SITES

In addition to the web sites listed in this section, other RFP Sections may list web sites where design criteria references used in this solicitation package may be found.

NOTE: FOR ITEMS (a), (b), AND (c) BELOW, REFERENCES TO RECEIVING APPROVAL FROM OTHER GOVERNMENT AGENCIES FOR ALTERNATIVE DESIGNS ARE NOT APPLICABLE TO THIS PROJECT. THE CONTRACTOR IS THE DESIGNER WHEN READING THESE DOCUMENTS. ALL ITEMS LISTED BELOW ARE CONSIDERED TO BE A PART OF THE RFP SOLICITATION DOCUMENT (AS APPLICABLE) AND THE RESULTANT CONTRACT.

(a) TECHNICAL MANUALS (TM), TECHNICAL INSTRUCTIONS (TI), AIR FORCE MANUALS (AFM), ENGINEERING TECHNICAL LETTERS (ETL), ARMY ARCHITECTURAL AND ENGINEERING DESIGN CRITERIA (AEI), SUSTAINABLE DESIGN DOCUMENTS, AND MILITARY HANDBOOKS (MIL HNDBK) can be obtained from the National Institute of Building Sciences Construction Criteria Base (CCB) on CD-ROM. Contact the CCB directly at (202) 289-7800 for an order form or obtain an order form at the following Internet address: http://www.ccb.org/ccbsubscribe/Subsmain.asp. There is a regular annual subscription fee to the CCB (Price is noted on internet address, currently \$700 per year). The CCB is available on CD-ROM or DVD. Selected references are also available for downloading in Acrobat .pdf file format at the following Internet address:

http://www.hnd.usace.army.mil/techinfo.

Additional web sites are as follows:

(1) TECHNICAL MANUALS, ETL's, ETC:

www.usace.army.mil/inet/usace-docs

(2) AIR FORCE DESIGN CRITERIA

http://afpubs.hq.af.mil

## (3) UNIFIED FACILITIES GUIDE SPECIFICATONS (UFGS)

The Contractor shall provide project specification in accordance with Paragraph 3.2, herein. This includes Government Provided Specifications as referenced in Paragraph 3.2.2. If the Contractor chooses to utilize UFGS (Specintact) specifications to develop project specifications, the Government has them located on the CD-ROM issued with solicitation (Specsintact files under a directory labeled "Guides". An Index of available UFGS sections is included in Attachment No. 3 of this RFP. Specsintact software is available on the CCB referred to paragraph (a) above or may be downloaded at the following internet address: <a href="http://si.ksc.nasa.gov/specsintact/software/software.htm">http://si.ksc.nasa.gov/specsintact/software/software.htm</a>. SI Version 3.0 (Version SI3.3.460) or later shall be used. The new unified submittal format shall be selected for file format. A copy of the software (SI Version 3.0) has been included on the CD-ROM issued with this solicitation. See folder: "Software", file "si3.exe".

#### 1.3 ENGLISH UNIT REQUIREMENTS

This project shall be developed and accomplished using "English Unit" measurement.

#### 1.4 DEFINITIONS

## 1.4.1 CONTRACTOR

Firm or company to whom award was made to design and construct the Replace Family Housing, Task order No.1, located at Whiteman AFB, Missouri.

## 1.4.2 DESIGN

Documents or deliverables, as defined in this section, prepared by or under the direct supervision of registered professional architects and engineers and proposed by the Contractor to meet the requirements of this solicitation.

## 1.4.3 DESIGN DRAWINGS

Documentation showing in graphic and quantitative form the extent, design, location, relationships, and dimensions of the construction to be provided by the Contractor. (Note: Shop Drawings, as defined in Section 01330: SUBMITTAL PROCEDURES are not to be provided until after design drawings are determined satisfactory for construction.)

#### 1.4.4 DESIGNER

Architects and Engineers (A-E) associated with the Contractor who are responsible for (1) preparing the design documents, (2) checking construction submittals for compliance with the prepared Construction set design documents and (3) have the qualifications and experience specified herein.

## 1.4.5 REQUEST FOR PROPOSAL (RFP)

Documents furnished to prospective offerors containing proposal information and specifying criteria and project requirements for design and construction of the Replace Family Housing, Task Order No.1, located at Whiteman AFB, Missouri. The documents include this specification, attachments, and the RFP drawings.

#### 1.5 QUALITY ASSURANCE (SEE SECTIONS 00110 AND 01451)

#### 1.6 SUBMISSION OF DESIGN DRAWINGS, SPECIFICATIONS AND DESIGN ANALYSES

#### 1.6.1 DESIGN CERTIFICATION

Within <u>each design submittal</u>, the Contractor shall certify that all items submitted in the design documents comply with the requirements of the RFP. The criteria specified in this RFP are binding contract criteria and in case of any conflict, after award, between the RFP criteria and Contractor's submittals, the RFP criteria will govern unless there is a written and signed agreement between the Contracting Officer and the Contractor waiving a specific requirement. The Contractor shall present with the letter of transmittal for each design submittal (including the 100% corrected design submittal) a certification that the submittal (plans, specifications, design analysis, etc.) complies with the requirements stated above, similar to that shown at Attachment A of this section.

## 1.6.2 DEVIATIONS

Deviations from the RFP technical requirements shall be identified in the letter of transmittal. Deviations from the RFP technical requirements will be considered and accepted by the Contracting Officer if the change result in a significant improvement to the project or it exceeds the minimum RFP technical requirements as determined by the Contracting Officer.

## 1.6.3 FIELD INSPECTION

The Contractor shall verify field conditions, which are significant to design, by field inspection, researching and obtaining all necessary existing facility as-built drawings and reproducing them for his own use as necessary, and discussing status with knowledgeable personnel. The information shall be reflected in the design documents. The contractor shall arrange and conduct all necessary actions to schedule appointments with base personnel, gain access to existing utility systems, conduct existing files research, and perform data gathering to verify existing conditions for preparation of the design documents.

## 1.6.4 DRAWINGS

- a) Software Requirements: All design drawings shall be done by the Contractor in AutoCAD 2000 .dwg file format. See Section 01040: AS-BUILT DRAWINGS.
- **b) RFP Drawings:** RFP Drawings will be furnished in AutoCAD file format with this solicitation and are considered useable for planning purposes, they will be furnished electronically in the Phase 2 portion of the solicitation to allow Offerors electronic files to layout their site and housing concept.

Design documents, as required by the Final design submittal stated hereafter, shall include construction drawings, specifications and design analysis/calculations for categories such as, but not limited to, architectural, interior design, structural, mechanical, electrical, grading, drainage, paving, and outside utility services. Specifications shall be in sufficient detail to fully describe and demonstrate the quality of materials, the installation and performance of equipment, and the quality of workmanship. Detailing and installation of all equipment and materials shall comply with the manufacturer's recommendations. The design analysis shall be for each discipline of work and shall include all features with the necessary calculations, tables, methods and sources used in determining equipment and material sizes and capacities, and shall provide sufficient information to support the design.

## 1.6.5 DESIGN REVIEWS

Two design reviews will be held for project under the base bid. **Special Note:** The complete process and all requirements will be repeated as detailed in the specifications if the **optional** work is awarded. The contractor shall assume the base work and optional work will not be awarded at the same timeframe or can be combined under one single design effort.

All review conferences will be held at Whiteman AFB, Missouri. The first design review will be for the 100 percent Site Design and 65% Housing Design. The second review will be a backcheck review of the 100% Corrected Site Design and the 100% Housing Design. The Government may call for a review conference of the 100% Corrected Housing Design if comments and designs issues are not solved through means of Dr Checks and correspondence. This may require a single discipline needed to attend or several design team members to attend. Once the Corrected Final Designs (100 percent Site and Housing) are reviewed and determined to be satisfactory for the purpose of beginning construction, the Contractor shall prepare and distribute full sets (site and housing combined) of documents for construction. The Contractor shall attend the design reviews, visit the site and make other trips as necessary during the design to accomplish the work.

## 1.6.6 DOCUMENT PACKAGING

The design submittals include the Final 100% Site and 65% Housing, and 100% Housing (complete design for all design disciplines, based on the RFP drawings and specifications for stages of design required and listed herein. These documents shall be packaged and stamped "For Review Only – 100% Final Site Design and 65% Housing Design" and "For Review Only – 100% Final Housing Design", each sheet of the drawings shall also be stamped. The Corrected Final (100 percent) backcheck design submittal (Site and Housing), after the Government review of the Final (100 percent) design, shall be stamped "100% Corrected Design"; and each sheet of the drawings shall also be stamped. The 100% Corrected Design submittal is for making corrections resulting from review comments and for preparing the final "For Construction" documents. Once, the 100% corrected design submittal has been approved and corrected, the Contractor shall prepare and submit the "For Construction" set of design documents. These documents shall be packaged and stamped "For Construction", and each sheet of drawings shall also be stamped. Once the "For Construction" design is deemed compliant by the Government, any changes to the plans and specifications shall be submitted as a deviation in accordance with Section 01330 Submittal Procedures. No additional time for completion of the contract will be granted to the Contractor due to insufficient design submittals. See paragraph 3.6.6 "Government Design Review and Acceptance" for additional requirements.

## 2 PRODUCTS

# 2.1 MATERIAL REQUIRED FOR 100% FINAL SITE AND 65% HOUSING DESIGN AND 100% FINAL HOUSING DESIGN SUBMITTAL:

All drawings included in the required technical data for the proposal submission shall be developed to design stages required below for completion. In addition to the individual utility plans, submit a combined utility plan drawn to the same scale as the individual utility plans. Furnish mechanical and electrical plans, with complete schematics, to show all air conditioning, plumbing and electrical work. A licensed professional engineer or architect shall perform all design and calculations. A licensed professional engineer or architect shall stamp all drawings. The following design documents shall be provided in the design submittals. Note: Various drawings for housing design are listed to submit at "100%Only". For those listed as such, no 65% Housing Design drawing is required.

#### 2.1.1 SITE/INFRASTRUCTURE

- a) Environmental Protection Plan: The Contractor shall prepare and submit, with the 100% Design review documents, an Environmental Protection Plan in accordance with the requirements of Section 01355 ENVIRONMENTAL PROTECTION, including the recycling of Freon refrigerant. As an Appendix to the Environmental Protection Plan, the Contractor shall include copies of all environmental reports, permits, approvals, applications, and associated documents as an Appendix to the Environmental Protection Plans.
- b) Location Plan and Vicinity Map: The Location Plan and Vicinity Map provided in the Request for Proposal (RFP) shall be updated as necessary and included in the drawings. The Location Plan shall include the Contractor's access route, staging area, stockpile area, and the overall project site.
- c) Removal Plan: The removal plan will show the existing physical features and condition of the site before construction. Each physical feature to be removed shall be hatched as indicated on the standard legend sheet, a legend on the removal plan, and properly noted: to be removed, to remain, or to be relocated. The Removal Plan shall be prepared at the same drawing scale and use the sheet boundaries as the Site Plan.
- d) Site Plan: The Site Plan shall show all the site layout information necessary to field locate the houses, street work, driveways, sidewalks, patios, privacy fence, security fence, recreation areas, and all other appurtenances to be constructed as part of the project. All major site work to be constructed will be dimensioned for size and location. The Site Plan will identify all site-related items such as: curbs, driveways, walks, retaining walls, mechanical units, electrical transformers locations, etc. in accordance with a standard legend sheet or with additional legends or notes. Drawing scales of 1" = 30' or 1' = 40' are acceptable scales for the Site Plan. The contractor shall consider the project's construction area, drawing legibility, number of sheets required in choosing the drawing scale. The Site Plan, prior to adding the dimensions and notes, should serve as the base sheet to other Plans, such as: Utilities Plan, Grading and Drainage Plans and Landscape Plan. Existing and proposed contours or utility lines shall not be shown on Site Plan. Physical features that will remain after the proposed construction has been completed shall be shown. This plan, or the Location Plan, will also show any free zones, construction limits, etc. Whenever the Site Plan occupies more than one sheet of drawings, a Key Plan shall be included. Additional plans showing specific areas of the site in smaller scales can be included if more detail is necessary.
- e) Site Details: The Contractor shall provide details for all site furnishings, playground equipment, patio privacy fence, accessories, handicap accessible ramps, signage, and any other site structure or item requiring a detail for clarity and construction accuracy.
- f) Landscape Plan: A detailed Landscape Plan showing trees, shrubs, ground cover, and seeded or sodded areas shall be prepared by the Contractor. The Landscape Plan shall be prepared by a fully qualified, experienced professional Landscape Architect. The Contractor shall specify types of plant materials that are locally grown, commercially available and acclimated to the project environment. The Landscape Plan shall include a plant materials schedule or listing. This schedule shall include botanical names, common names, key, size and the

- method of transplanting. The Landscape Plan shall also show all un-surfaces ground areas disturbed by construction within the project limits with these areas shown to be seeded or sodded as required.
- g) Landscape Details: The Contractor shall verify the methods of planting to meet the project site/installation requirements and provide the necessary Landscape Details to perform the contract design work. Details shall reflect local practices and conditions for installation.
- h) Pavement Plan: The pavement plan will show the existing streets and condition of the pavement prior to construction. The survey plan shall be used to create the pavement plan. This drawing shall be used to indicate the location of any pavement work required.
- i) Grading and Drainage Plan: A final grading and drainage plan shall be provided at the same scale as the site plan. New and existing grading contours shall be indicated at 1 ft contour intervals. Indicate the finished floor elevation of new houses and structures. Plans shall show the layout of the new and existing storm drainage and roof drainage systems. Provide spot elevations at building corners, changes in grade, etc. Storm drainage lines and structures shall be labeled. The rim elevation of all manholes, curb inlets, and area inlets shall be indicated. Provide location and description of benchmarks and indicate vertical and horizontal datum's.
- j) Storm Drain and Culvert Profiles: Provide profiles of any new storm drains and culverts showing new and existing grades, new and existing utilities, pavement sections in detail, pipe diameters and lengths, pipe slopes, invert elevations, etc. Class and gauge of all storm drain and culvert pipes shall be provided.
- **k)** Foundation Drainage System: Provide plan, typical cross section, and details of the foundation drainage system.
- j) Drainage Structure Details: Provide typical details of all storm drainage structures. The use of alternate details shall be approved prior to submitting the final design documents. A, B, C, and D dimensions of all storm drain and subdrain structures shall be shown. Dimensions may be shown on either the storm drain schedule, the storm drain profiles, or on the storm drain structure detail drawings.
- k) Storm Water Pollution Prevention Plan (SWPPP) Site Map: Provide a site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, areas which will not be disturbed, locations of major structural and nonstructural erosion controls identified in the SWPPP, locations where stabilization practices are expected to occur, locations of off-site material, waste, borrow or equipment storage areas, surface waters (including wetlands), and locations where storm water discharges to a surface water.
- 1) Erosion Control Details: Provide details of best management practices used to control erosion.
- m) Typical Pavement Sections and Details: Provide typical driveway, sidewalk, patio, pavement overlay, curb and gutter, curb ramps, and road repair sections and details.
- n) Typical Driveway Pavement Joint Layout Plans: Provide typical pavement joint layout plans for each type of housing unit provided. Each type of joint shall be shown with a different symbol and a joint legend provided. Under no circumstances shall pavement joint layout plans be combined with any other plans.
- o) Typical Patio Joint Layout Plans: Provide typical joint layout plans for the patio area for each type of housing unit provided. Each type of joint shall be shown with a different symbol and a joint legend provided. Under no circumstances shall pavement joint layout plans be combined with any other plans.
- p) Sanitary Sewer and Water Plans: Sanitary sewer and water plans shall show locations of new and existing mains and service lines, elevation of sewer pipe, valves, connections. Thrust blocks, manholes, etc. Scale to match site plans.
- **q) Natural Gas Plans:** Scale to match site plans foe natural gas plans. Natural gas distribution system plans shall include, but not limited to, the following:

- --Locations of existing mains and service lines, including those to be removed.
- --Locations of new gas service mains and service lines, including points of connection to existing piping.
- -- Trench installation Details for both the main lines and the service lines.
- --Valve Box Details.
- -- Gas Service Regulator Assembly Detail.
- -- Cathodic Protection Details.
- r) Electrical Distribution Plans (Scale to match site plan): Electrical distribution plan shall show site lighting (street and walkway), primary cable routing (new and existing) pad-mounted transformers & switches, and secondary service laterals. Scale to match site plans.

Show the following:

- -- Site lighting (street and walkway)
- -- Primary cable routing (new and existing)
- -- Pad-mounted transformers & switches
- -- Secondary service laterals
- --On-Site One Line Diagram
- s) On-Site Distribution Transformer Schedule (with the following headings:)
  - -- Transformer Designation
  - -- Transformer Size (KVA)
  - --Building(s) Served
  - --Primary Phase(s) and Circuit to which connected.
- t) On-Site Details (Site Lighting, Trenching, etc.)

## 2.1.1.1 Required Site Infrastructure Specifications (100% Complete):

Required technical specifications Kansas City District Guides for site and infrastructure shall be complete and fully edited to reflect and coordinate with the drawings. All specification indexes shall be completely edited to reflect the paragraphs retained in the body of the specification. All references that have not been used in the body of the specification shall be edited from the technical specification.

**For Asbestos Abatement Specification:** Procedures for demolition of structures with Category I nonfriable asbestos-containing materials in place are described in Section 01400 SPECIAL SAFETY REQUIREMENTS FOR DEMOLITION. The Contractor shall comply with applicable Federal and state regulations.

**For Lead-Based Paint:** Any lead-based painted architectural components proposed for removal prior to demolition shall be identified in writing and the removal procedures and associated health and safety protocols shall be provided. Where lead-based painted surfaces will remain in the units for demolition, follow the protocols described in Section 01400 SPECIAL SAFETY REQUIREMENTS FOR DEMOLITION.

Note: Much of the site work requires the specific use of Government Provided Guide Specifications as indicated in Attachment and Paragraph 3.2.2. GOVERNMENT PROVIDED GUIDE SPECIFICATIONS, herein. In other areas of site work, which do not require the specific use of a Government Provided Guide Specifications, the Contractor shall produce final specifications as required by Paragraph 3.2 SPECIFICATIONS.

## 2.1.2 HOUSING UNITS

Submit for each typical housing type.

## a) Floor Plans: (Scale 1/4" = 1'-0")

For each housing type, show the following:

- -- Overall dimensions
- -- Room description with dimensions and areas
- -- Furniture layouts
- -- Vanities
- -- Appliances (including occupant-owned washer, dryer, and micro-wave Oven; and contractor-furnished refrigerator, stove, and

Dishwasher)

- -- Plumbing fixtures locations
- -- Kitchen layout
- -- Door swings
- -- Garage locations
- -- Patio, Walks, Privacy and Good Neighbor fencing
- -- Exterior/Interior bulk storage
- -- Service (trash) area
- -- Furnace, AC units, and hot water heater locations
- -- Calculated gross and net floor areas
- -- Electrical switches, outlets, telephone jacks, CATV jacks
- -- Electric light fixture locations and schedule
- -- Equipment Layout
- -- Smoke/carbon monoxide detectors

## b) Exterior Elevations: (Scale 1/4" or 1/8" = 1'- 0")

For each housing type, show all sides of a building complete with notes indicating the exterior finish materials shall be shown.

## c) Interior Elevations: (Scale 1/4'' = 1' - 0'')

Show the following:

- -- Kitchen
- -- Bathrooms

## d) Building Cross Sections for Each Type of Building: (Scale 1/4" = 1'-0")

For each housing type, show the following:

- --Structural system
- --Building materials
- --Finishes
- --Vertical dimensions

## e) Typical Wall Section: (Scale 3/4'' = 1' - 0'')

For each housing type, show the following:

- -- Typical wall
- --Foundation
- --Floor and roof section
- --Materials
- --Cavity wall
- --Party wall w/STC rating

- --Fire rated construction with UL or Gypsum Association File No.
- --Thermal Insulation
- f) Finish Schedule: Show finish schedule of all rooms.
- g) Fire and Sound Rated Assemblies: Show the construction of fire and sound rated assemblies in detail and note on the drawings the tested design upon which the construction is based. Note any modification to materials or method of construction. Detail all penetrations of rated partitions.
- h) **Detail References:** All details shall be referenced to floor plans, elevations or sections.
- i) Kitchen Cabinet Elevations: Kitchen cabinet elevations shall note cabinet sizes.
- j) Foundation and Floor Slab Plans: (Scale: 1/4" = 1'-0")

For Each Housing Type show:

- --Dimensions and materials of foundation system (If not shown on any other typical drawing)
- k) Structural Floor and Roof Framing Plans: (Scale: 1/4" = 1'-0")

For Each Housing Type show:

- --Structural framing members and spacing dimensions
- --Details of any main structural framing members or connections such as beams, headers, etc.
- l) Architectural Rendering: Contractor shall provide ground level perspective artist's renderings of typical family housing units completed with walks, parking, and landscaping. Renderings shall be no smaller than 14 inches by 18 inches or larger than 28 inches by 36 inches, multi-colored, and shall be suitably titled, matted, and framed.
- m) Color Boards: Color Boards shall be submitted showing color and pattern of materials prepared for interior and exterior finish materials, including floor, wall and ceiling finishes, roofing, siding, and trim shall be submitted to Contracting Officer on 8-1/2 inches by 11 inches sample boards/binder format.
- n) Consumer Information for Handicapped Requirements: The Contractor shall furnish a report including drawings in accordance with the Uniform Federal Accessibility Standards, paragraph 4.34.4 "Consumer Information" for the modified and adaptable features of each applicable unit type of family housing.

## 2.1.3 SPECIFIC MECHANICAL AND PLUMBING REQUIREMENTS

Required Plans, Diagrams, Schedules and Details on Unit Mechanical Drawings (100% Only Design Stages):

a) Mechanical Floor Plan: (Scale 1/4" = 1'-0")

The floor plans shall show all principle architectural features of the building which will affect the mechanical design. The floor plan shall also show the following:

- --Room designations
- --Mechanical legend and applicable notes
- --Location of all ductwork or piping (double line ductwork required 100% only)
- --Location and capacity of all terminal units (i.e., registers, diffusers, grilles, hydronic baseboards)
- --Exhaust fan and range hood location
- --Size of all ductwork and piping shown 100% only
- --Thermostat location
- --Location of heating equipment (i.e., furnace(s))
- --Location of air conditioning equipment (Condensing Unit Refrigerant Piping and Sizing. 100% only)
- --Return air paths (i.e., undercut doors)

- Transfer grilles
- --Flue piping location; sizing 100% only
- --Piping diagrams for forced hot water system (if used) 100% only
- --Fuel supply and return piping
- --Location of all Mechanical Equipment, including Furnace, Condensing Unit, Exhaust Fans, Range Hood, etc.
- -- Locations of all Balancing Dampers and Access Panels 100% only.
- --Location of Combustion Air and Furnace Flues; sizing 100% only.
- -- Natural Gas Service Entrance and location of Gas Piping; sizing 100% only.
- -- Dryer Exhaust Ducting.

## **Equipment Schedule Sheet:**

Complete equipment schedules shall be provided. Schedule shall also include:

- -- Capacity
- --Electrical characteristics
- --Efficiency (if applicable)
- -- Manufacturer's name
- -- Any optional features to be provided
- --Physical size
- --Water Heater Schedule.
- --Furnace/AC Coil Schedule. --Condensing Unit Schedule.
- --Exhaust Fan Schedule.
- --Range Hood Schedule.
- -- Register and Grille Schedule.
- -- Exhaust Fan Schedule.

#### **Details:** c)

Construction details, sections, elevations, etc. shall be provided where required for clarification of methods and materials of design. All roof and exterior wall penetrations shall be detailed on the drawings. As a minimum, the following Details and Schedules shall be provided:

- --Furnace Connection Detail, including Gas Piping, Flexible Connectors, and Filter Access 100% only.
  - --Side-Views of Mechanical Equipment Room to ensure proper space exists for installation of Furnace and Water Heater with associated Ductwork, Piping, and Flues 100% only.
  - -- Condensing Unit Mounting Detail 100% only.
  - --Exhaust Fan Details 100% only.
  - --Roof and Exterior Wall Penetrations shall be detailed **100% only**.
  - --Below Slab Radon Piping Installation Detail.
  - -- Radon Piping Manifold Detail.
  - -Water Service Entrance Detail.
  - --Water Heater Detail.
  - --Furnace AC Coil Condensate Drain Detail.
  - --Radon Sump Pump Details.
  - --Dishwasher Hook-Up Detail, including Connection to Disposal and Sink 100% only.
  - --Sump Pump Detail.

## d) Plumbing Floor Plan: (Scale: 1/4" = 1'-0")

The floor plan shall show all principal architectural features of the building that will affect the plumbing design. The floor plan shall also show the following:

- --Room designations
- --Plumbing Legend and applicable Notes.
- --Fixture Schedule and Fixture designations
- --Location of utility entrances
- --Waste, vent, and hot and cold water pipe locations (sizes 100% only)
- --Location of hot water heater
- --Plumbing riser diagram 100% only
- --Below Slab Radon Piping.
- --Above Floor Radon Piping.
- -- Radon Exhaust Fan Location.
- --Radon Vent locations through Roof and visual light location.
- --Location of Water Service Entrance.
- --Water Heater, Furnace, and Floor Drain Locations.
- --Water Heater Flue Piping, including Venting through Roof.
- --Foundation Drain Sump Pump.
- --Plumbing Vents through Roof locations.
- -- Waste Piping Cleanout Locations.
- --Wall Hydrant Locations.
- --Water Hammer Arrestor Locations 100% only.
- -- Access Panels and locations 100% only.
- **Plumbing Plans:** Separate-plumbing plans will not be required if sufficient information can be shown on the mechanical plans to meet the requirements shown above.

## 2.1.4 SPECIFIC ELECTRICAL REQUIREMENTS

## a) Electrical Floor Plan: (Scale 1/4" = 1'-0")

The floor plans shall show all principle architectural features of the building which will affect the electrical design. The floor plan shall also show the following:

- --Room designations
- --Electrical legend and applicable notes
- --All lighting fixtures, properly identified
- --Location of all smoke detectors
- --Location of telephone outlets
- --Location of television outlets
- --All switches for control of lighting
- --All receptacles
- --The location and designation of all panelboards. Plans should clearly indicate type of mounting required (flush or surface) and be reflected accordingly in specifications.
- --Service entrance (conduit and main disconnect)
- --Location, designation and rating of all motors and/or equipment which requires electrical service.
- -- Show method of termination and/or connection to motors and/or equipment.
- --Show all necessary junction boxes and disconnects
- --Controllers (approximate only), conduit stubs and receptacles required to serve the motor and/or
- -- equipment. (100% only)
- **Building Riser Diagram** (from pad-mounted transformer to unit load center panelboard): Indicate the types and sizes of all electrical equipment and wiring. Include grounding and metering requirements.

## c) Unit Load Center Panelboard Schedule(s):

Schedule shall indicate the following information:

- --Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting
- --Branch Circuit Designations.
- --Load Designations
- --Circuit Breaker Characteristics (Number of Poles, Trip Rating, AIC Rating)
- --Branch Circuit Connected Loads (AMPS).
- -- Any Special Features

## d) Lighting Fixture Schedule:

(Schedule shall indicate the following information:)

- --Fixture Designation
- --General Fixture Description
- --Number and Type of Lamp(s)
- -- Type of Mounting
- -- Any Special Features
- e) Details: Construction details, sections, elevations, etc. shall be provided where required for clarification of methods and materials of design.

## 2.2 DESIGN ANALYSIS & DESIGN CALCULATIONS

Design analysis and design calculations shall include complete site and housing unit descriptions and design calculations for storm drainage improvements, utility distribution systems, structural elements, electrical and mechanical systems, and roadway pavement and shoulder design.

## 2.2.1 STORM DRAINAGE SYSTEM CALCULATIONS

Storm Drainage System Calculations shall include the following:

- a) Drainage area map showing boundaries of each drainage area and respective drain inlet or culvert.
- **b)** Storm run-off calculations for each drainage area.
- c) Tabulation of capacities of new storm drains including: diameter and slope of storm drain pipes, design storm discharge and velocity for each storm drain pipe, maximum discharge capacity of each storm drain pipe, headwater depth of each culvert during design storm discharge.

## 2.2.2 FOUNDATION DRAINAGE SYSTEM CALCULATIONS

Foundation Drainage System Calculations shall include selection of pipe sizes and sump pump calculations.

## 2.2.3 STRUCTURAL DESIGN CALCULATIONS

Design calculations are required for all structural elements not covered prescriptively by the International Residential Code (IRC). Calculations shall be stamped by a registered structural engineer.

## 2.2.4 MECHANICAL DESIGN ANALYSIS

- a) Water Supply Calculations: Submit calculations at Final (100 percent) design stages to determine correct main water supply to each unit and/or building.
- b) Mechanical Calculations: Complete mechanical design calculations shall be provided for all equipment such as furnaces, cooling coils, condensing units, piping, exhaust fans, air duct design, louvers, gas services and piping, plumbing, water heaters, etc. Heating and cooling calculations may be provided by computer analysis (i.e., Elite Software Inc., Trane Trace Load 700, Carrier E20-II Hourly Analysis Program (HAP) version 3.04 loads program etc.). Also, see paragraph 3.4 "Design Analysis".

#### 2.2.5 ELECTRICAL DESIGN ANALYSIS

All design and calculations for the electrical systems shall be performed by a licensed professional engineer with experience in family housing, and shall be stamped as such. The design shall be a separate bound assembly, in one or more volumes, of all the functional and engineering criteria, design information, and calculations applicable to the project design. The analysis shall be organized in a format appropriate for review, approval, and record purposes. The design calculations shall be presented in a clear and legible form, with all methods and references identified, and all assumptions and conclusions explained.

#### a) Load Calculations

- (1) A separate demand load calculation shall be provided for each type of individual living unit (per NEC Art. 220). Include catalog cuts of the electrical data for the HVAC equipment that was selected by the mechanical designer.
- (2) A separate demand load calculation shall be provided for each type of multifamily dwelling. (Per NEC Art. 220)
- (3) Calculate the demand load for each pad-mounted distribution transformer by adding all the demand loads (minus the HVAC load), for each type of living unit connected to the transformer, and then multiply by the appropriate demand factor found in the following table. Then, the HVAC load and any site lighting loads are added to this figure to arrive at the transformer demand load. (Note that the demand factors in the table shall not be applied to the HVAC loads and the Site Lighting loads, which are included at 100% demand.

#### DEMAND FACTOR TABLE

Number	Demand	Number	Demand	Number	Demand
of	Factor	of	Factor	of	Factor
Quarters	Percent	Quarters	Percent	Quarters	Percent
1	80.0	19	18.6	37	13.2
2	60.0	20	17.5	38	13.0
3	50.0	21	17.1	39	12.8
4	45.0	22	16.6	40	12.6
5	40.0	23	16.1	41	12.4
6	35.0	24	15.8	42	12.2
7	32.0	25	15.6	43	12.0
8	29.0	26	15.4	44	11.8
9	27.0	27	15.2	45	13.6
10	25.0	28	15.0	46	11.4
11	24.0	29	14.8	47	11.2
12	23.0	30	14.6	48	11.0
13	22.0	31	14.4	49	10.8
14	21.0	32	14.2	50	10.6
15	20.0	33	14.0	51	10.4
16	19.4	34	13.8	52	10.4
17	18.7	35	13.6	53	10.1
18	18.3	36	13.4	54	10.0

- (4) Calculate the demand load for each phase of each circuit of the primary distribution system. The loads shall be computed using the same method as outlined for the pad-mounted transformers in the previous paragraph. (Note that for 54 or more living-units, the demand factor shall be 10%).
- (5) In addition to the complete load calculations required hereinbefore, provide load summary tables which group and identify each type of demand load calculated. (Individual living-units, multifamily dwellings, padmounted distribution transformers, and primary phases.)

## b) Voltage Drop (VD) Calculations

- (1) Select conductor sizes of primary feeders and calculate maximum footage for each phase of each primary circuit, using a maximum allowable VD for each circuit.
- (2) Select conductor sizes of site lighting circuits and calculate the VD for each circuit. (Maximum allowable VD = 3%).
- (3) Select service lateral conductor sizes for each multifamily swelling and calculate the maximum length (in feet) of each different type of service lateral using a maximum allowable VD of 3%.
- (4) Select unit feeder conductor sizes for each individual living unit and calculate the VD for the worst case branch circuit. The combined voltage drop for the service laterals, unit feeders, and branch circuit shall not exceed 5%.
- (5) Short Circuit Calculations: Calculate the available fault current at the main breaker of the individual living-unit load center panel. A coordination study shall be provided for all fuse selections.

## 3 EXECUTION

#### 3.1 DRAWINGS

Prepare, organize, and present drawings in the format specified herein. Provide drawings complete, accurate and explicit enough to show compliance with the RFP requirements and to permit construction. Drawings illustrating systems proposed to meet the requirements of the RFP performance specifications shall reflect proper detailing for each such system to assure appropriate use, proper fit, compatibility of components and coordination with the design analysis and specifications required by this section. Coordinate drawings to ensure there are no conflicts between design disciplines and between drawings and specifications.

## 3.1.1 DRAWINGS FORMAT

Full size drawings are considered 28 inches x 40 inches. Half-size drawings are considered 14 inches x 20 inches. Title block shall be as indicated in the Kansas City District CADD Standards Manual. The Cover Sheet of the Contractor prepared drawings shall bear the stamp or seal and signature of the registered architect or appropriate engineer responsible for the work and proposed to meet the RFP requirements. Drawing code numbers for the design and construction drawings shall be as follows:

Drawing Code: AF 711-15-01

## 3.1.2 DRAWINGS SEQUENCE

Arrange drawings by design discipline in accordance with Kansas City District CADD Standards Manual.

#### 3.2 SPECIFICATIONS

The Contractor shall develop specifications utilizing commercial Construction Specifications Institute (CSI), 16 Division, 3 Part Section Format. These specifications shall conform to the applicable criteria requirements indicated in the solicitation (Section 01000, Parts 1-14). For these specification sections, write at the Medium scope level of detail as described in CSI Masterformat. Use Mediumscope level section numbers and titles as identified in CSI Masterformat. Adjust section numbers which conflict with the specifications used in the Project Specifications. Each of these developed specification sections shall be in the same format as the CSI format. Commercially available guide specifications such as "SpecText" published by The Construction Specifications Institute and "MasterSpec" published by The American Institute of Architects or Unified Facilities Guide Specifications (UFGS given on the CD-ROM as an option for use by the Offeror) may be used subject to the format, coding and submittal paragraph requirements. References to the "Architect/Engineer" and the "Owner" shall be changed to refer to the "Government" or "Contracting Officer," as appropriate. The specifications shall clearly identify, where appropriate, the specific products chosen to meet the requirements of the specifications (manufacturers' brand names and model numbers or similar product information). The Contractor shall be responsible for coordinating references, along with the technical requirements, to specific specification sections (number and title) within the project specifications. Section references (title and number) shall be revised to reflect the titles and numbers of specification sections used.

For required materials (catalog cuts) submitted under SECTION 00110 PROPOSAL SUBMISSION AND EVALUATION in the Phase 2 portion of the solicitation, if sufficient information is indicated, not withstanding some interior and site requirements, which require both specifications and catalog cuts, the Contractor can furnish the catalog cut information provided under 00110 for the final specification usage in the construction documents. If used, the catalog cuts must demonstrate the "General Usage", "Product" and "Execution" (Manufacturer's Installation) instructions. All Specification information shall be arranged by CSI Division 16 format and numbered with TOC. Catalog Cuts shall display an intro sheet with a spec number for easy reference and indexing as combined with fully written specifications for a complete, concise set of construction specifications.

# 3.2.1 DIVISION 1 SPECIFICATION SECTIONS

Include Division 1 specifications (already edited by the Government) sections 01040 AS-BUILT DRAWINGS, 01200 WARRANTY OF CONSTRUCTION, 01320A PROJECT SCHEDULE, 01330 SUBMITTAL PROCEDURES, 01355 ENVIRONMENT PROTECTION, 01400 SPECIAL SAFETY REQUIREMENTS FOR DEMOLITION AND RENOVATION, and 01451A CONTRACTOR QUALITY CONTROL. These sections are contained in the RFP as part of the project specifications without change. Copies of these sections are included with the RFP on the advertised CD-ROM. Any other Division 1 Specifications required by the Contract shall be the responsibility of the Contractor. No other Division 1 Specifications will be required, unless specified otherwise in this solicitation or required by the Contractor.

# 3.2.2 GOVERNMENT PROVIDED GUIDE SPECIFICATIONS

Infrastructure work requires the use of Government Provided Guide Specifications (see list below). The contractor is required to fully incorporate these sections and present them at the 100% design stage. No catalog cut information from Section 00110 may be used in place of specifications listed below. They are mandatory for design and construction. These Specifications and Software are included on the Advertised CD-ROM:

SECTION 02220 Demolition

SECTION 02230 Clearing and Grubbing

SECTION 02300 Earthwork

SECTION 02315 Excavation, Filling, and Backfilling for Buildings

SECTION 02620 Subdrainage System

SECTION 02700 Asphaltic Concrete Intermediate Leveling and Surface..

SECTION 02712 Lime-Modified Subgrade

SECTION 02722 Graded, Crushed Aggregate Base Course and Rigid ...

SECTION 02748 Bituminous Tack and Prime Coats

SECTION 02760 Field Molded Sealants for Sealing Joints in Rigid Pavement..

SECTION 02763 Pavement Markings

SECTION 02770 Concrete Sidewalks, Curbs and Gutters, and Exterior...

SECTION 03100 Structural Concrete Formwork

SECTION 03200 Concrete Reinforcement

SECTION 03300 Cast-In-Place Structural Concrete

SECTION 03350 Non-Metallic Light-Reflective Surface-Hardened Concrete...

SECTION 13280 Asbestos Abatement

SECTION 13281 Lead Hazard Control Activities

# 3.2.3 FORMAT FOR PROJECT SPECIFICATIONS

Submit the project specification, including a Cover page and Table of Contents, printed with a word processor using good quality white paper. The corrected final (100 percent) specifications with review comments incorporated shall be cleaned up (without marked-up edits) and submitted in both hard copy and on magnetic media (A Microsoft Windows compatible CD-ROM and compatible with the Microsoft Word 2000 format. The Cover page and attachments to specification sections shall be prepared in a Microsoft Word (compatible with Microsoft Word 2000) format. Carbon copies are not acceptable.

Each specification section shall include a Section Table of Contents, which is combined with the page numbering of the specification section.

The Cover page shall be similar to the RFP Cover page and shall include:

- a. Project title, Project Number, activity and location
- b. Construction contract number

- c. Construction Contractor's name and address
- d. Design firm's name and address
- e. Names of design team members (Designers of record) responsible for each Contractor prepared technical discipline of the project specification
- f. Name and signature of a Principal of the design firm

The Table of Contents shall list the 16 Divisions contained in CSI format and the specification section numbers and titles contained in the project specification.

#### 3.3 CONSTRUCTION SUBMITTALS

All construction submittals shall be in accordance with Section 01330, "SUBMITTAL PROCEDURES".

Construction submittal types and products, including the submittal description numbers and data package numbers, shall be included in the specification sections, where required. When appropriate, use specific product terms instead of the generic product terms contained in the specifications sections (e.g., asphalt shingles, built-up roofing, EPDM single ply, etc. vs. roof covering; concrete masonry units, brick, metal siding, etc. vs. exterior skin; mineral fiber board, block, batt or blanket, polystyrene, polyurethane, polyisocyanurate board vs. insulation).

# 3.3.1 SUBMITTALS REGISTER (FORM)

Prepare and maintain a Submittals Register. The Submittal Register (ENG Form 4288 "Submittal Register" shall be prepared. Additional instructions for completing the form are contained in Section 01330, "Submittal Procedures."

Fill in columns "c" through "f" and submit with the 100 percent design submittal. The Submittal Register will be returned to the Contractor along with the reviewed and accepted design.

Resubmit the Submittal Register as a construction submittal as required in Section 01330, "SUBMITTAL PROCEDURES." The Contractor shall provide an electronic copy of the accepted submittal register, three (3) working days prior to the pre-construction conference. Remaining columns will be filled in at the appropriate time and by the appropriate authorities during construction.

# 3.4 DESIGN ANALYSES

Prepare design analyses (basis of design and calculations) for each applicable design discipline. The design analyses shall be a presentation of facts to demonstrate that the concept of the project is fully understood and that the design is based on sound engineering. The design analysis for each discipline shall include:

- a. A basis of design consisting of:
  - (1) An introductory description of the project concept which addresses the salient points of the design;
  - (2) An orderly and comprehensive documentation of criteria, rationale, assumptions and reasoning for system selection.
- b. Calculations required to support the design. Complete site and housing unit design calculations for utility distributions systems, structural elements and electrical and mechanical systems. Include computations for sizing equipment, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Also include final passive energy strategy performance calculations for each housing unit type. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all-passive systems and features. Use of hourly

energy load computer simulation (e.g., TRNSYS, DOE 2.1 Blast, etc.) is required. Performance calculations shall also determine the peak-cooling load of all passive solar unit types. These calculations can be used to size the unit's mechanical systems.

- c. Equipment Schedule. Based on the results of calculations, provide a complete list of the materials and equipment proposed for heating and plumbing, with the manufacturer's published cataloged product installation specifications and roughing-in data. The heating equipment data shall include the manufacturer's wiring diagrams, installation specifications, ARI certification, and the standard warranty for the equipment. In addition, provide the manufacturer's published cataloged capacities for supply diffusers as evidence that the arrangement of supply air outlets in each room will provide the throw and spread characteristics required to cover completely all exterior wall surfaces with the blanket of warm air at the proper design velocities.
- d. Project Engineering Considerations and Instructions (ECI) for Final Design Analysis.

The Contractor shall not make reference to the RFP solicitation to avoid stating the requirements for the basis for design.

### 3.4.1 ENGINEERING CONSIDERATIONS AND INSTRUCTIONS (ECI) FOR FIELD PERSONNEL

# 3.4.1.1 Separate Appendix

Under a separate appendix in the Final Design Analysis, the Design-Build Contractor shall include the following items:

- a. Features critical to the quality of the final construction product requiring special attention.
- b. Submittals requiring special attention during construction.

Format for ECI's shall include the following information:

- c. Special user requirements or instructions.
- d. Assumed field conditions, pertinent significant aspects, or critical phases of the project used as a basis of project design.

# 3.4.1.2 Format

ENGINEERING CONSIDERATIONS A	ND INSTRUCTIONS
Project Name:	
Location:	
Designer Name:	_ Phone:
Discipline:	

Design-Build designers have prepared the following engineering considerations and instructions (ECI). These ECI's should be followed during the construction of the above project. If you have any questions, contact the appropriate Design-Build designer."

# 3.4.1.3 Distribution of ECI's

In addition to including ECI's in a separate appendix of the final design analysis and after acceptance of the 100 percent corrected design and prior to the start of construction, the design-build Contractor shall e-mail a copy of the ECI's to the

appropriate U.S. Army Corps of Engineer's Field representative for his consideration with a copy also sent to the appropriate individual in following office(s): CENWK-EC-C and CENWK-PM-M. The Government will provide the names and e-mail addresses to the design-build Contractor at either the pre-design or pre-construction conference.

# 3.4.2 REQUESTS FOR INFORMATION, MEETING MINUTES AND COMMENTS

Copies of Requests for Information (RFI) made by the Contractor to the Government shall be included as an appendix to the design analysis. An index of each RFI, which documents the RFI number, the date RFI given to Government, the date the RFI is answered and the Action Response provided by the Government.

A copy of all meeting minutes and design review comments (if any) with action responses shall be included as an appendix to the design analysis.

Appendices for RFI's and Meeting Minutes and design review comments shall have page numbering that follows the same format as for Calculations listed above.

#### 3.5 DESIGN CERTIFICATION

The Contractor shall provide certification signed by an officer of the Contractor's company attesting that the drawings, specifications and design analyses prepared for the construction of the facility meet or exceed the requirements of the RFP. The certification shall accompany the submission of the design documents along with names and disciplines for the designers of record. This design certification shall include a list of approved or upward deviations (variations) from the solicitation or accepted final design. Prepare the design certification and transmittal letter in the format shown on Attachment A included at the end of this section.

# 3.6 REVIEW BY GOVERNMENT AGENCIES

# 3.6.1 DISTRIBUTION OF DESIGN DOCUMENTS FOR CONFORMANCE REVIEW

Government agencies shall receive review documents twenty one (21) days prior to review conferences. Agencies reviewing documents, and in the quantities indicated, are listed below. All documents must contain an index of contents. Work shall be completed to the percentage required prior to conference. Design work shall <u>not</u> continue during the review period between the 100% design submission and the 100% design review conference. All submittals shall be transmitted by <u>express mail</u>. Originals of transmittal letters should be sent to the Kansas City District and copies should accompany each mail package. Transmittal letters shall indicate distribution by use of the "ATTN" code shown in the address. Design document set shall include the items listed below. Some of the Construction submittals are also listed. Design submittals shall be submitted as a complete package. The distribution listed below also applies to all design reviews and design package accepted for construction.

#### 3.6.1.1 Submittal Items

The submittal items listed below are intended to identify the different design submittals required throughout the design process and select submittals required during and at the completion of Construction. Each submittal item has an Abbreviation, which will be used in conjunction with the number of required copies. See paragraphs 3.6.1.3 through 3.6.1.6 for required copies for distribution.

# SUBMITTAL ITEM - ABBREVIATION

Design Analysis Narrative - DANar Design Analysis Calculations - DACalcs

Specifications - Specs

Submittal Register - SubReg

Drawings (1/2 size) - **Dwg-1/2** 

Drawings (Full size) - Dwg-full

Meeting Minutes with Annotated Comments and Other Attachments - MMin

As-Built Drawings - Asblt

Electronic Media Drawings - EMDwg

Electronic Media Specifications - EMSpecs

Electronic Media Design Analysis - EMDA

Design Certification Letter - DCLet

Color Board - ColBd

DD Form 1354 - Transfer and Acceptance of Military Real Property - DD1354

Environmental Protection Plan - EP Plan

Engineering Considerations and Instructions - ECI

Renderings - Rend

# 3.6.1.2 Activity Distribution Addresses

U.S. Army Engineering District, Kansas City

ATTN: CENWK-PM-M, Mr. Rick Whitsell

601 E. 12st

Kansas City, Missouri 64106

Phone: (816) 983-3465

U.S. Army Engineering District, Kansas City ATTN: CENWK-EC-C, Mr. Ken Niemann

601 E. 12st

Kansas City, Missouri 64106

Phone: (816) 983-3197

Fort Leonard Wood Resident Office

US Army Corps of Engineers ATTN: CENWK-FM-WD, Mr. Rex Ostrander

PO Box 200

Fort Leonard Wood, Missouri 65473

Phone: (573) 596-0081

Whiteman Resident Office

US Army Corps of Engineers

ATTN: CENWK-FM-WD-W, Mr. Jay Rudy

PO Box 7003

Whiteman AFB, Missouri 65305

Phone: (660) 563-2311

HO ACC

ATTN: HQ ACC/CECW, Mr. Vance Mitchell 129 Andrews Street, Suite 102, Room 315 Langley AFB, VA 23665-2769 Phone: (757) 764-3680

509th CES/CEC

ATTN: Mr. Randy White

Whiteman AFB, Missouri 65305

Phone: (660) 687-

# 3.6.1.3 Final 100 % Site & 65% Housing Design Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses. The number of copies required for each submittal item is listed below.

# **Activity**

# CENWK-PM-M CENWK-EC-C CENWK-FM-WD HQ, ACC/CECW 509 CES/CEC CENWK-FM-WD-W

<b>Submittal</b>						
<u>item</u>						
DANar-	10	2	2	2	10	3
DACalcs-	6	2	2	2	10	3
Specs-	10	2	2	2	10	3
SubReg-	2	2	2	-	-	3
	10	2	2	2	10	3
MMin-*(1)	10	2	2	2	10	3
EMDwg-*(2)	1	-	-	-	-	1
DCLet-	10	2	2	2	10	1
Colbd-*(3)	1	_	-	1	1	1
EP Plan	1	-	1	1	1	1
Rend-*(4)	1	_	-	1	1	1
ECI-	10	2	2	1	10	3

<sup>\*100</sup> PERCENT SITE SUBMITTAL NOTES:

Fifteen (15) percent of all drawings, representative of all design disciplines, shall be submitted in AutoCAD 2000 on CD-ROM to verify that the CADD standards being specified are complied with.

# 3.6.1.4 Final 100 % Housing Design Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses. The number of copies required for each submittal item is listed below.

# **Activity**

CENWK-PM-M CENWK-EC-C CENWK-FM-WD HQ, ACC/CECW 509 CES/CEC CENWK-FM-WD-W

Submittal item

<sup>\*(1)</sup> To be submitted after Review Conference per requirements of this section.

<sup>\*(2)</sup> Electronic Media Drawings:

<sup>\*(3)</sup> Color boards shall show actual color samples of all proposed exterior and interior finishes.

<sup>\*(4)</sup> Pencil or Computer Sketch Rendering (3 views) of typical housing units.

DANar-	10	2	2	2	10	3
DACalcs-	6	2	2	2	10	3
Specs-	10	2	2	2	10	3
SubReg-	2	2	2	-	-	3
Dwg-1/2-	10	2	2	2	10	3
MMin-*(1)	10	2	2	2	10	3
EMDwg-*(2)	1	-	-	-	-	1
DCLet-	10	2	2	2	10	1
Colbd-*(3)	1	-	-	1	1	1
EP Plan	1	-	1	1	1	1
Rend-*(4)	1	-	-	1	1	1
ECI-	10	2	2	1	10	3

<sup>\*100</sup> PERCENT HOUSING SUBMITTAL NOTES:

Fifteen (15) percent of all drawings, representative of all design disciplines, shall be submitted in AutoCAD 2000 on CD-ROM to verify that the CADD standards being specified are complied with.

# 3.6.1.5 Corrected Final (100 Percent) Design Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses. The number of copies required for each submittal item are listed below.

#### **Activity**

CENWK-PM-M	CENWK-EC-C	CENWK-FM-WD HC	). ACC/CECW	509 CES/CEC	CENWK-FM-WD-W
OB1 ( ) ( II I I I I I I I I I I I I I I I	CEITHE C	CELTIFIC TIE	, 1100, 020 11	CON CERTOE	CEITITE TO TE

<u>Submittal</u>						
<u>item</u>						
DANar-	10	2	2	2	10	4
DACalcs-	6	2	2	2	10	4
Specs-	10	2	2	2	10	4
SubReg-	2	2	2	-	-	4
Dwg-1/2-	10	2	2	2	10	4
MMin-*(1)	10	2	2	2	10	4
EMDwg-*(2)	1	-	-	-	-	1
DCLet-	10	2	2	2	10	1
Colbd-*(3)	1	-	-	1	1	1
EP Plan	1	-	1	1	1	1
Rend-*(4)	1	_	-	1	1	1
ECI-	10	2	2	1	10	4
DD1354-*(4)	1	1	1	1	1	1

<sup>\*</sup>CORRECTED FINAL (100 PERCENT) DESIGN SUBMITTAL NOTES:

<sup>\*(1)</sup> To be submitted after Review Conference per requirements of this section.

<sup>\*(2</sup> Electronic Media Drawings:

<sup>\*(3)</sup> Color boards shall show actual color samples of all proposed exterior and interior finishes (Resubmit only if changed form 65% design).

<sup>\*(4)</sup> Pencil or Computer Sketch Rendering (3 views) of typical housing units. (Resubmit only if changed form 65% design).

<sup>\*(1)</sup> Electronic Media Drawings AutoCAD 2000 on CD-ROM shall be submitted to verify that the CADD standards being specified are complied with.

- \*(2) Color Boards are not required if there are no changes from the previous design submittal and if only minor changes are required, submit applicable coded samples (with tape ready for application) and corrected color legend. If major changes to the color board are required, resubmit the Color boards with actual color samples of all proposed exterior and interior finishes and revised corrected color legend.
- \*(3) Color Copy of Rendering and electronic copy of scanned image of rendering on CD.
- \*(4) Draft submittal of DD Form 1354.

# 3.6.1.6 "For Construction" Set Distribution

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses. The number of copies required for each submittal item are listed below.

# **Activity**

# CENWK-PM-M CENWK-EC-C CENWK-FM-WD HQ, ACC/CECW 509 CES/CEC CENWK-FM-WD-W

10	2	2	2	10	4
6	2	2	2	10	4
10	2	2	2	10	4
2	2	2	-	-	4
10	2	2	2	10	4
10	2	2	2	10	4
1	-	-	-	-	1
10	2	2	2	10	1
1	-	-	1	1	1
1	-	1	1	1	1
1	-	-	1	1	1
10	2	2	1	10	4
	6 10 2 10 10 1 10 1 1 1 1	6 2 10 2 2 2 10 2 10 2 11 - 10 2 1 - 1 - 1 -	6     2     2       10     2     2       2     2     2       10     2     2       10     2     2       1     -     -       1     -     -       1     -     -       1     -     -       1     -     -	6     2     2     2       10     2     2     2       2     2     2     -       10     2     2     2       10     2     2     2       1     -     -     -       10     2     2     2       1     -     -     1       1     -     1     1       1     -     -     1       1     -     -     1	6     2     2     2     10       10     2     2     2     2     10       2     2     2     -     -     -       10     2     2     2     2     10       10     2     2     2     2     10       1     -     -     -     -     -       10     2     2     2     10       1     -     -     1     1       1     -     1     1     1       1     -     1     1     1       1     -     1     1     1

<sup>\*&</sup>quot;FOR CONSTRUCTION" SET SUBMITTAL NOTES:

Copies shall incorporate any additional comments made to the Corrected Final (100 percent) design submittal.

\*(1) Electronic Media Drawings (AutoCAD 2000), Electronic Media Specifications (compatible with MS Word 2000), and Electronic Media Design Analysis (compatible with MS Word 2000) and Adobe Acrobat 5.0. The Design Analysis Calculations shall be included with the design analysis narrative and shall be scanned and saved in Adobe Acrobat 5.0. The design analysis and calculations shall utilize bookmarks for each chapter of the design analysis and each appendix or calculations.

Electronic Media shall be on CD-ROM (Recordable compact disk with minimum 650 megabyte capacity)

- \*(2) Reflects all changes made through accepted Corrected Final (100 Percent) Design. Color Boards are not required if there are no changes from the previous design submittal and if only minor changes are required, submit applicable coded samples (with tape ready for application) and corrected color legend. If major changes to the color board are required, resubmit the Color boards with actual color samples of all proposed exterior and interior finishes and revised corrected color legend.
- \*(3) Framed and matted color Renderings and electronic copy of scanned image of rendering on CD (If different than previous rendering submittal)
- \*(4) In addition, the Contractor shall e-mail the designated offices a copy of the ECI per requirements stated in this section.

# 3.6.1.7 As-Built Submittals

See paragraphs above explaining Submittal Abbreviation Codes and Activity Distribution Addresses. The number of copies required for each submittal item are listed below.

# Activity

CENWI	K-PM-M	CENWK-EC-C	CENWK-FM-W	D HQ, ACC/CECW	509 CES/CEC	CENWK-FM-WD-W
Submittal Item						
Asblt-	*	*	*	*	*	*
DD1354-*(1)	1	1	1	1	1	1

<sup>\*</sup>NOTES for As-Built Submittals:

# 3.6.1.8 Design Submittal Alternative

The design-build Contractor may submit <u>hard copy</u> design analysis, design analysis calculations and appendices, specifications, submittal register, design certification letter, and engineering considerations and instructions on CD-ROM in an Adobe Acrobat 5.0 .pdf format and maximum of 2 hard copies per office per submittal listed above (CD's are substituted for hard copy numbers). If this alternative is selected, each of these documents shall utilize bookmarks with titles, which ease the review of the design. Each design submittal item and submittal item components shall be made easy to find (i.e. each specification section, chapters and appendices of design analysis, and each submittal item). This alternative will only be allowed if the design-build Contractor presents a legible and easy to review design. Failure to meet this requirement on one design submittal will result in requiring all future submittals and resubmittals to be hard copy as required above, at no additional cost to the Government.

#### 3.6.2 REVIEW COMMENTS:

For each design review submittal, the Contractor will be furnished comments from Kansas City District and other agencies involved in the review process approximately 14 days after receipt and review conference will be held approximately 21 days after receipt. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he/she shall clearly outline, with justification reasons for noncompliance at the design review conference in order that the comments can be resolved. Annotated comments, including the disposition of all comments shall be furnished in writing by the Contractor within five (5) days of the review conference and shall be recorded in the Contractor prepared Meeting Minutes described in paragraph 3.7.6.1. The written documentation shall be forwarded in the same quantities to the distribution list shown in paragraph: "Distribution of Design Documents for Conformance Review" above.

<sup>\*</sup>See Section 01040. AS-BUILT DRAWINGS for requirements.

<sup>\*(1)</sup> Final submittal of DD Form 1354.

# 3.6.3 USING AUTOMATED REVIEW MANAGEMENT SYSTEM:

Conference and post conference action: Government personnel, from the above Government Agencies, will present review comments for discussion and resolution. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Valid comments will be incorporated. After receipt of final corrected design documents upon incorporation of all backcheck comments (as many backchecks as are deemed necessary by the Government will be conducted), the Kansas City District will recommend acceptance to proceed with construction. The Government intends to utilize the Dr. Checks review system, which is available at: www.buildersnet.org/drchecks, for processing review comments and responses. Access rights will be provided to the Design-Build Contractor after contract award. The Government, however, reserves the right to not accept design document submittals and withhold design payments, if comments are of too great significance. In this case, every effort shall be made during follow-up action between the Contractor and the Kansas City District to resolve conflicts and problems such that documents can be fully accepted. However, if final submittal(s) are incomplete or deficient, requiring correction by the Contractor and resubmittal for review, the cost of rehandling and reviewing will be deducted from payment due the Contractor at the rate of \$1000.00, for each design discipline requiring resubmittal, per submittal. "Design Disciplines" in this paragraph consist of Architectural, Structural, Mechanical, Electrical, and Civil/Site work.

#### **3.6.4 DELAYS**

Delays caused by the Contractor in completion of the Final (100 percent) design or the Corrected Final (100 percent) design will not be considered as valid reason to delay completion of the entire design. The Government may not be held liable for delays caused by re-submittal efforts caused by designs submitted, which are rejected by the reviewers.

# 3.6.5 REPRODUCTION (FOR CONSTRUCTION):

Upon the Government's completion of the review of the Corrected Final (100 percent) Design submittal, the Contractor shall reproduce copies of the design documents (accepted for the purposes of beginning construction), subject to the incorporation of the Corrected Final (100 percent) design review comments. The Cover Sheet of the Contractor prepared drawings shall bear the stamp or seal and signature of the registered architect or appropriate engineer responsible for the work and proposed to meet the RFP requirements. The date on each drawing shall reflect the month and year that the drawings were cleared for the purposes of beginning construction. The Cover Sheet of the drawings, Cover Sheet of the Specifications, and Cover Sheet of the Design Analysis shall include the date that the design documents were cleared for the purposes of beginning construction and all cover sheets shall be stamped "For Construction". The Contractor shall provide corrected (100 percent) specifications in both hard copy and electronic media (compatible with MS Word 2000). Distribution shall be as indicated above. The originals will be retained by the Contractor for recording of as-built conditions. Upon completion of the project, the accepted design documents corrected to reflect as-built conditions shall be supplied to the Government. See Section 01040 AS-BUILT DRAWINGS for as-built drawing requirements.

# 3.6.6 GOVERNMENT DESIGN REVIEW AND ACCEPTANCE

# 3.6.6.1 Design Review Conference and Post-Design Review Conference Action:

All design review conferences shall be held at Whiteman AFB, Missouri. Government personnel will forward review comments to the Contractor for discussion and resolution prior to the design review conference. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the design review conference adjourns. Unresolved problems will be resolved by immediate follow-on action at end of conferences. Valid comments will be incorporated. Upon satisfactory Government review of the Corrected Final (100 percent) design documents, the Kansas City District will formally provide Government acceptance necessary to initiate construction. The Government, however, reserves the right to not accept design document submittals and to withhold design payments, if comments are of too great a significance. In this case, every effort shall be made during follow-up action between the Contractor and the Kansas City District to resolve conflicts and problems such that documents can be fully accepted. However, if final submittal(s) are incomplete or deficient, requiring correction by the Contractor and resubmittal for review, the cost of

rehandling and reviewing will be deducted from payment due the Contractor at the rate of \$1000.00, for each design discipline requiring resubmittal, per submittal. The Contractor shall submit to the Contracting Officer within five (5) calendar days, two (2) copies of meeting minutes summarizing major decision points and issues which requires resolution and the action office. Annotated comments shall be attached to these minutes.

# 3.6.6.2 Complete Design Documents

The Contractor shall submit complete design documents in the same quantity and to the same offices listed above in paragraph "Distribution of Design Documents for Conformance Review", for each corrected final (100 percent) design submittal (one or more) until the Government is satisfied that all review comments have been addressed and resolved.

# 3.6.6.3 Accuracy and Completeness of Design

Reviews by the Government of the design documents shall not be construed to be an endorsement of the accuracy or completeness of the design. Design deficiencies or omissions in the accepted design shall be the responsibility of the Contractor.

# 3.6.7 DD FORM 1354, TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

The Contractor shall provide, for acceptance, a Draft DD Form 1354 "Transfer and Acceptance of Military Real Property" (Copy attached at the end of this section) with the Corrected Final (100 percent) design documents. The Final Form 1354 shall be submitted with the As-Built submittals, near the end of the construction of the project. DD Form 1354 shall be filled out in accordance with Draft Army Pamphlet 405-45 "Real Property Inventory Management", Table B-16 "Preparation of DD Form 1354" (Copy attached) and Army Pamphlet 415-28 "Guide to Army Real Property Codes" (Copy is available at the following website: http://www.usapa.army.mil/gils/). The number of copies and distribution of the Draft and Final DD Form 1354 shall be as shown in the distribution requirements above.

#### 3.7 REVISIONS TO THE ACCEPTED DESIGN

- (a) The accepted design will be used by all parties involved in construction and in administration of the contract. Therefore, it is imperative that the design documents be kept up to date and an effective system of making and distributing changes be implemented. Since changes to the design increase risk of construction errors and deplete available administrative resources, every effort shall be made to minimize revisions to the accepted design. One of the measures of the Contractor's effectiveness of management will be how well the goal of minimizing changes to the accepted design is met. The use of effective quality control during design and utilization of experienced and capable designers are some of the means that are expected to be used to accomplish this goal.
- (b) If revisions to the accepted design become necessary, the procedures described in Section 01330 SUBMITTAL PROCEDURES will be used to accomplish the revisions. The revisions will be considered a "Variation" and shall be submitted as a Government Review (Resident Engineer) submittal. All the requirements in paragraph: "Variations" in Section 01330 SUBMITTAL PROCEDURES will apply to revisions to the accepted design. All design analysis and calculations necessary to establish that the proposed revision satisfies applicable design requirements shall be included in the submittal.

# Attachment A

[Contractor's I	Letterhead]
-----------------	-------------

[Date:] [Contract No]
[Reviewing Component Address]
Subj: DESIGN CERTIFICATION AND TRANSMITTAL FOR  [Project Title]  [Project Location]  [Contract No]
Gentlemen
Enclosed are the following documents, which I hereby certify are in compliance with the RFP requirements of the subject construction contract and can be used to commence construction subject to Government approval:
1. Design Drawings
2. Project Specification
3. Design Analysis
<ul> <li>a. Civil</li> <li>b. Water Supply and Wastewater Collection</li> <li>c. Architectural</li> <li>d. Interior Design</li> <li>e. Structural</li> <li>f. Mechanical</li> <li>g. Fire Protection</li> <li>h. Electrical</li> <li>i. Environmental Protection, Compliance and Permits  <ul> <li>j. Health and Safety</li> <li>k. Sustainable Design</li> </ul> </li> </ul>
4. Submittals Register
[Typed Name and Signature of an Officer of the Contractor's Company]
5. All other Design Submittals
6. Deviations
Copy to: [As standard with the Contractor] End Of Section

TRANSMITTAL NO. TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE (Read instructions on the reverse side prior to initiating this form) SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the contractor) FROM: CONTRACT NO. CHECK ONE: THIS IS A NEW TRANSMITTAL THIS IS A RESUBMITTAL OF TRANSMITTAL SPECIFICATION SEC. NO. (Cover only one section with PROJECT TITLE AND LOCATION CHECK ONE: THIS TRANSMITTAL IS FOR GOV'T. AIPROVAL ITEM DESCRIPTION OF ITEM SUBMITTED FOR VARIATION FOR MFG OR CONTR. NO. CONTRACT REFERENCE (Type size, model number/etc.) CONTRACTOR (See NO. CAT.. CURVE OF CE DOCUMENT USE CODE instruction USE COPIES DRAWING OR SPEC. DRAWING CODE (See instruction no. 8) PARA. NO. SHEET NO. a. d e. f. REMARKS I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated. NAME AND SIGNATURE OF CONTRACTOR SECTION II - APPROVAL ACTION ENCLOSURES RETURNED (List by Item No.) NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY DATE ENG FORM 4025-R, MAR 95 (ER 415-1-10) EDITION OF SEP 93 IS OBSOLETE. SHEET OF (Proponent: CEMP-CE)

#### INSTRUCTIONS

- 1. Section I will be initiated by the Contractor in the required number of copies.
- 2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
- 3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.
- 4. Submittals requiring expeditious handling will be submitted on a separate form.
- 5. Separate transmittal form will be used for submittals under separate sections of the specifications.
- 6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".
- 7. Form is self-transmittal, letter of transmittal is not required.
- 8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
- 9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

#### THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted. E -- Disapproved (See attached).

B -- Approved, except as noted on drawings. F -- Receipt acknowledged.

C -- Approved, except as noted on drawings. FX -- Receipt acknowledged, does not comply Refer to attached sheet resubmission required.

D -- Will be returned by separate correspondence. G -- Other (Specify)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

CONTRACT NO.

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	01355A	SD-01 Preconstruction Submittals														
		Environmental Protection Plan	1.7	G												
		[]														
	01525	SD-01 Preconstruction Submittals														
		' '	1.8	G												
		Activity Hazard Analysis (AHA)	1.9	G												
		Crane Critical Lift Plan	1.8.1	G												
		SD-06 Test Reports														
		Reports	1.13													
		Accident Reports	1.13.1													
		Monthly Exposure Reports	1.13.3													
		Regulatory Citations and	1.13.4													
		Violations														
		Crane Reports	1.13.5													
		Certificate of Compliance														
		SD-07 Certificates														
		Confined Space Entry Permit														
	01780A	SD-02 Shop Drawings														
		As-Built Drawings	1.2.1	G RE												
		SD-03 Product Data														
		As-Built Record of Equipment and	1.2.2	G RE												
		Materials														
		Warranty Management Plan	1.3.1	G RE												
		Warranty Tags	1.3.5	G RE												
		Final Cleaning	1.6	G RE												
	02220	SD-07 Certificates														

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	02220	Work Plan															
	02230	SD-01 Preconstruction Submittals															
		Materials Other Than Salable	3.4.2														
		Timber															
	02300	SD-01 Preconstruction Submittals															
		Earthwork		G RE													
		SD-06 Test Reports															
		On-Site Materials		G KC													
		Borrow Materials		G KC													
		SD-07 Certificates															
		Testing	3.13	G RE													
	02315	SD-07 Certificates															
		Field Test Control		G RE													
		SD-06 Test Reports				1							$\vdash$				
	1	Testing	1			1				1			$\vdash$				
	02316	SD-07 Certificates	1			1				-			$\vdash$				
		Field Test Control	1	G RE		1				1		-	$\vdash$				
	+	SD-06 Test Reports	l						<u> </u>			-	$\vdash$				
	+	Field Density Tests	3.5.3						<u> </u>			-	$\vdash$				
	100000	Testing of Backfill Materials	3.5.2	G RE		1	1			1		-	$\vdash$				
	02620	SD-07 Certificates	100			1			<u> </u>			-	$\vdash$				
	+	Filter Fabric	2.2	G RE		1			<u> </u>			-	$\vdash$				
	+	Pipe for Subdrains	2.1	G RE					<u> </u>			-	$\vdash$				
		SD-04 Samples	<del> </del>			1				1		-	$\vdash$				
		Filter Fabric	2.2			1				-			$\vdash$				
L		Pipe for Subdrains	2.1														

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<u> </u>	02700	SD-07 Certificates														
_		Testing Laboratory, para. 1.6.1		G RE												
		Equipment, para. 2.3		G GD									_			
		Mixing Plant, para. 2.4		G KC									_			
		SD-06 Test Reports											_			
<u> </u>		Composition of Mixture, para.'s		G GD												
<u> </u>		2.2 thru 2.2.3.1														
<u> </u>		Coarse Aggregate, para. 1.4.2.1.a		G GD												
-		Fine Aggregate, para. 1.4.2.1.b		G GD												
<u> </u>		Mineral Filler, para. 1.4.2.1.c		G GD												
<u> </u>		Aggregate Gradation, para.		G GD												
<u> </u>		1.4.2.2.a														
		Crushed Particle Test, para.		G GD									_			
<u> </u>		1.4.2.2.b														
1	ļ	Specific Gravity Test, para.		G GD				<u> </u>					<u> </u>			
_		1.4.2.2.c														
1	ļ	Bituminous Material, para. 1.5		G GD				<u> </u>					<u> </u>			
₩	02712	SD-03 Product Data						_					_			
1		<del>                                     </del>	1.5	G RE				<u> </u>					_			
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₩		Field Density	3.5.2					_					_			
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₩		Lime		G RE				_					_			
1		Source		G RE				_					_			
1	<u> </u>	SAMPLING AND TESTING	3.4	G RE				<u> </u>					_			
	02714	SD-06 Test Reports														

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_	02714	Sampling and Testing	1.7										_			
		Approval of Materials	1.7.5	G RE												
		Evaluation	3.1.7	G RE												
	02721	SD-03 Product Data														
		Equipment	1.6													
		SD-07 Certificates														
		Material Source		G RE												
		SD-06 Test Reports														
		Sampling and Testing	1.4	G GD												
	02722	SD-03 Product Data														
		Equipment														
		SD-07 Certificates														
		Material Source		G GD												
	1	SD-06 Test Reports														
		Sampling and Testing	1.5	G G												
		Sampling and Testing	1.5	G G												
	02748	SD-06 Test Reports														
		Tests		G RE												
	02760	SD-08 Manufacturer's Instructions														
		Manufacturer's Recommendations														
		SD-01 Preconstruction Submittals														
	1	Construction Equipment List														
		SD-07 Certificates														
		Sealant and Back-up Materials		G RE												
	02763	SD-03 Product Data														
		Equipment Lists		G RE												

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	02763	SD-08 Manufacturer's Instructions														
		Mixing, Thinning and Application		G RE												
		SD-07 Certificates														
		Qualifications		G RE												
		SD-06 Test Reports														
		Material Tests		G RE												
		SD-07 Certificates														
		Volatile Organic Compound		G RE												
		(VOC) Content														
	02770	SD-06 Test Reports														
		Field Quality Control	3.8													
		SD-09 Manufacturer's Field														
		Reports														
$\bot$		Concrete	2.1					_								
+	03100	SD-05 Design Data				1		<u> </u>								
		Design	1.3													
$\perp$	ļ	Form Materials	2.1					<u> </u>								
		SD-02 Shop Drawings						_								
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$\perp$		SD-07 Certificates														
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		SD-04 Samples														
		Fiber Voids														
	03150	SD-03 Product Data														

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	03150	Preformed Expansion Joint Filler	2.2	G RE												
		Sealant	2.3	G RE												
	_	SD-08 Manufacturer's Instructions														
	_	Preformed Expansion Joint Filler	2.2													
	_	Sealant	2.3													
		SD-07 Certificates														
		Preformed Expansion Joint Filler	2.2													
		Sealant	2.3													
		SD-04 Samples														
		Preformed Compression Seals														
		and Lubricants														
		Field-Molded Type	2.3.4													
		Non-metallic Materials														
	03200															
$\perp$		Concrete Reinforcement System	1	G KC												
		SD-08 Manufacturer's Instructions														
		Welding	1.3	G RE				_								
		SD-07 Certificates														
$\perp$		Reinforcing Steel	2.3	G RE												
$\perp$	03300		1													
		Mixture Proportions	1.5	G RE												
$\perp$		SD-06 Test Reports	1													
		Testing and Inspection for	3.13	G RE												
		Contractor Quality Control														
		SD-07 Certificates	<u> </u>		ļ											
		Qualifications	1.3	G RE												

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-	03350	SD-07 Certificates														
		Certificate of Compliance		G KC												
-		SD-01 Preconstruction Submittals														
-		Service Record		G KC												
_	13280	SD-03 Product Data														
_	1	Respiratory Protection Program	1.12	G AE												
-	1	Cleanup and Disposal	3.11	G AE												
-	-	Detailed Drawings		G		-						-				
-	-	Materials and Equipment	l			-						-				
+		Qualifications	1.5	G AE				-								
-	1	Training Program	1.11													
+	1	Medical Requirements	1.10	0 15												
+	1	Encapsulants	2.1	G AE												
+	+	SD-06 Test Reports	2.0	C 15			-									
+	+	Exposure Assessment and Air  Monitoring	3.9	G AE		1	-			<del> </del>		1				
+	1	Local Exhaust Ventilation	1.20							1						
+	+	Licenses, Permits and	1.14	G AE						-						
+	+	Notifications	1.14	IG AE						-						
+	+	SD-07 Certificates														
+	1	Vacuum, Filtrationand Ventilation														
+	+	Equipment		<del>                                     </del>												
+	13281	SD-03 Product Data				1	<del> </del>					1				
+	13201	Materials and Equipment	1.18													
+	<del>                                     </del>	Expendable Supplies	1.19				<del> </del>									
+	+	Qualifications	1.5	G AE				$\vdash$				+				

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		13281	SD-06 Test Reports														
			Pressure Differential Log														
			Licences, Permits, and	1.11	G AE												
			Notifications														
			Accident Prevention Plan (APP)	1.7	G AE												
			Sampling and Analysis	1.13	G AE												
			Clearance Report	3.8	G AE												
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# SECTION 01355A

# ENVIRONMENTAL PROTECTION 02/02

# PART 1 GENERAL

#### 1.1 REFERENCES

EM 385-1-1

WETLAND MANUAL

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. AIR FORCE (USAF)

AFI 32-1053 Pest Management Program

U.S. ARMY (DA)

AR 200-5 Pest Management

# U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR	328	Definitions
40 CFR	68	Chemical Accident Prevention Provisions
40 CFR	152 - 186	Pesticide Programs
40 CFR	260	Hazardous Waste Management System: General
40 CFR	261	Identification and Listing of Hazardous Waste
40 CFR	262	Standards Applicable to Generators of Hazardous Waste
40 CFR	279	Standards for the Management of Used Oil
40 CFR	302	Designation, Reportable Quantities, and Notification
40 CFR	355	Emergency Planning and Notification
49 CFR	171 - 178	Hazardous Materials Regulations
	U.S. ARMY CORPS OF ENGI	NEERS (USACE)

01355A-1

(1996) U.S. Army Corps on Engineers Safety

Corps of Engineers Wetlands Delineation

and Health Requirements Manual

Manual Technical Report Y-87-1

# 1.2 DEFINITIONS

# 1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

#### 1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

#### 1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

# 1.2.4 Installation Pest Management Coordinator

Installation Pest Management Coordinator (IPMC) is the individual officially designated by the Installation Commander to oversee the Installation Pest Management Program and the Installation Pest Management Plan.

# 1.2.4 Project Pesticide Coordinator

The Project Pesticide Coordinator (PPC) is an individual that resides at a Civil Works Project office and that is responsible for oversight of pesticide application on Project grounds.

# 1.2.5 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor shall discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" shall occur. Land Application shall be in compliance with all applicable Federal, State, and local laws and regulations.

#### 1.2.6 Pesticide

Pesticide is defined as any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, or intended for

use as a plant regulator, defoliant or desiccant.

#### 1.2.7 Pests

The term "pests" means arthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds and other organisms (except for human or animal disease-causing organisms) that adversely affect readiness, military operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

# 1.2.8 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

#### 1.2.9 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

#### 1.2.10 Wetlands

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. Official determination of whether or not an area is classified as a wetland must be done in accordance with WETLAND MANUAL.

# 1.3 GENERAL REQUIREMENTS

The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations.

## 1.4 SUBCONTRACTORS

The Contractor shall ensure compliance with this section by subcontractors.

#### 1.5 PAYMENT

No separate payment will be made for work covered under this section. The Contractor shall be responsible for payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor. All costs associated with this section shall be included in the contract price. The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations.

#### 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G, [\_\_\_\_]

The environmental protection plan.

#### 1.7 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, the Contractor shall submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern shall be defined within the Environmental Protection Plan as outlined in this section. The Contractor shall address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but which the Contractor considers necessary, shall be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, the Contractor shall meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan shall be current and maintained onsite by the Contractor.

# 1.7.1 Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

#### 1.7.2 Contents

The environmental protection plan shall include, but shall not be limited to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.

- d. Description of the Contractor's environmental protection personnel training program.
- e. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. The plan shall include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.
- f. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site.
- g. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.
- h. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- i. Drawing showing the location of borrow areas.
- j. The Spill Control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1 [and the [\_\_\_\_]]. This plan shall include as a minimum:
  - 1. The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer and [the local Fire Department] [Facility Fire Department] [Facility Response Personnel] [Facility Environmental Office] in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.
  - 2. The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.
  - 3. Training requirements for Contractor's personnel and methods of accomplishing the training.
  - 4. A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
  - 5. The names and locations of suppliers of containment materials

and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.

- 6. The methods and procedures to be used for expeditious contaminant cleanup.
- k. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris. The plan shall include schedules for disposal. The Contractor shall identify any subcontractors responsible for the transportation and disposal of solid waste. Licenses or permits shall be submitted for solid waste disposal sites that are not a commercial operating facility. Evidence of the disposal facility's acceptance of the solid waste shall be attached to this plan during the construction. The Contractor shall attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. The report shall be submitted on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and shall be for the previous quarter (e.g. the first working day of January, April, July, and October). The report shall indicate the total amount of waste generated and total amount of waste diverted in cubic meters or tons along with the percent that was diverted.
- 1. A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. The plan shall detail the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government sponsored recycling programs to reduce the volume of solid waste at the source.
- ${\tt m.}$  An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.
- n. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time shall be included in the contaminant prevention plan. As new hazardous materials are brought on site or removed from the site, the plan shall be updated.
- o. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan shall include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, the plan shall include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, a copy of the permit and associated documents shall be included as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, the plan shall include

documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.

- p. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. The plan shall include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Contracting Officer.
- q. A pesticide treatment plan shall be included and updated, as information becomes available. The plan shall include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional Installation Project Office specific requirements. The Contractor shall follow [AR 200-5 Pest Management, Chapter 2, Section III "Pest Management Records and Reports" for data required to be reported to the Installation] [AFI 32-1053 Sections 3.4.13 and 3.4.14 for data required to be reported to the Installation].

### 1.7.3 Appendix

Copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents shall be attached, as an appendix, to the Environmental Protection Plan.

# 1.8 PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report shall be signed by both the the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor shall protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

#### 1.9 SPECIAL ENVIRONMENTAL REQUIREMENTS

The Contractor shall comply with the special environmental requirements listed here [\_\_\_\_\_] and included at the end of this section.

#### 1.10 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

#### 1.11 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

#### 1.12 HTRW PERIMETER AIR MONITORING

For the protection of public health, the Contractor shall monitor and control contaminant emissions to the air from HTRW remedial action area sources to minimize short term risks that might be posed to the community during implementation of the remedial alternative in accordance with Section 01450 CHEMICAL DATA QUALITY CONTROL and the following.

1.12.1	Perimeter Air Contaminant of Concern
[]	].
1.12.2	Time Averaged Perimeter Action Levels
[]	a. Concentration []. b. Time [].
1.12.3	Perimeter Sampling/Monitoring Location[s]
[]	].
1.12.4	Monitoring Instruments/Sampling and Analysis Methods
[]	].
1.12.5	Staffing
[]	].
PART 2	PRODUCTS (NOT USED)
PART 3	EXECUTION

#### 3.1 ENVIRONMENTAL PERMITS AND COMMITMENTS

[This paragraph supplements the Contractor's responsibility under the contract clause "PERMITS AND RESPONSIBILITIES" to the extent that the Government has obtained the [\_\_\_\_\_]. The Contractor shall comply with the terms and conditions of the attached [\_\_\_\_\_] at the end of this section.]

[The Contractor shall be responsible for obtaining and complying with all environmental permits and commitments required by Federal, State, Regional, and local environmental laws and regulations.]

#### 3.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.

#### 3.2.1 Work Area Limits

Prior to commencing construction activities, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are not to be disturbed shall be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

# 3.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

### 3.2.3 Erosion and Sediment Controls

The Contractor shall be responsible for providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. The Contractor shall construct or install temporary and permanent erosion and sediment control best management practices (BMPs) [as indicated on the drawings] [as specified in Section 01356 STORM WATER POLLUTION PREVENTION MEASURES]. BMPs may include, but not be limited to, vegetation

cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. [The Contractor's best management practices shall also be in accordance with the [\_\_\_\_] National Pollutant Discharge Elimination System (NPDES) Storm Water Pollution Prevention Plan (SWPPP) which may be reviewed at the [\_\_\_\_] Environmental Office.] Any temporary measures shall be removed after the area has been stabilized.

# 3.2.4 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Erosion and sediment controls shall be provided for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas.

#### 3.3 WATER RESOURCES

The Contractor shall monitor construction activities to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation unless otherwise indicated. All water areas affected by construction activities shall be monitored by the Contractor. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

# 3.3.1 Cofferdams, Diversions, and Dewatering Operations

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to maintain compliance with existing State water quality standards and designated uses of the surface water body. The Contractor shall comply with [the State of [\_\_\_\_] water quality standards and anti-degradation provisions] [and] [the Clean Water Act Section 404, Nation Wide Permit No. [\_\_\_\_]].

# 3.3.2 Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments. [Construction of stream crossing structures shall be in compliance with Clean Water Act Section 404, Nation Wide Permit No. [\_\_\_\_].]

#### 3.3.3 Wetlands

The Contractor shall not enter, disturb, destroy, or allow discharge of contaminants into any wetlands[.] [except as authorized herein. The Contractor shall be responsible for the protection of wetlands shown on the drawings in accordance with paragraph ENVIRONMENTAL PERMITS, REVIEWS, AND APPROVALS. Authorization to enter specific wetlands identified shall not relieve the Contractor from any obligation to protect other wetlands within, adjacent to, or in the vicinity of the construction site and associated boundaries.]

# 3.4 AIR RESOURCES

Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards.

#### 3.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs. The Contractor shall comply with all State and local visibility regulations.

#### 3.4.2 Odors

Odors from construction activities shall be controlled at all times. The odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

#### 3.4.3 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise. The Contractor shall comply with the provisions of the State of [\_\_\_\_\_] rules.

# 3.4.4 Burning

[Burning shall be prohibited on the Government premises.] [Burning will not be allowed on the project site unless specified in other sections of the specifications or authorized in writing by the Contracting Officer. The specific time, location, and manner of burning shall be subject to approval.] [Fires shall be confined to a closed vessel, guarded at all times, and shall be under constant surveillance until contents have burned out or have been extinguished.] [Burning shall completely reduce the materials to ashes.]

# 3.5 HTRW AIR EMISSION CONTROL

The Contractor shall implement the following control(s) to meet or exceed performance levels identified in HTRW PERIMETER AIR MONITORING.

3.5.1	Air	Emission	Control	to	Meet	Action	Levels

[\_\_\_\_].

# 3.5.2 Excavation/Production/Processing Rate Reduction

[\_\_\_\_].

# 3.5.3 Exposed Surface Area Reduction

[\_\_\_\_].

#### 3.6 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

#### 3.6.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling, storage, and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. [The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill shall be the minimum acceptable off-site solid waste disposal option. The Contractor shall verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate.] [Waste materials shall be hauled to the Government landfill site [shown on the drawings] [designated by the Contracting Officer].] [The Contractor shall comply with [site procedures] [Federal, State, and local laws and regulations] pertaining to the use of landfill areas.]

# 3.6.2 Chemicals and Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Government. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 150 mm of the top. Wastes shall be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

# 3.6.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. The Contractor shall, at a minimum, manage and store hazardous waste in compliance with 40 CFR 262 [and shall manage and store hazardous waste in accordance with the [Installation] [Project Office] hazardous waste management plan]. The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. The Contractor shall segregate hazardous waste from other materials and wastes, shall protect it from the weather by placing it in a safe covered location, and shall take precautionary measures such as berming or other appropriate measures against accidental spillage. The Contractor shall be responsible for storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, State, and local laws and regulations. The Contractor shall transport Contractor generated hazardous waste off Government property within [60][\_\_\_\_] days in accordance with the

Environmental Protection Agency and the Department of Transportation laws and regulations. The Contractor shall dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer[ and the Facility Environmental Office]. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility. [The disposition of Contractor generated hazardous waste and excess hazardous materials are the Contractor's responsibility.] [The Contractor shall coordinate the disposition of hazardous waste with the [Facility's] [Project Office's] Hazardous Waste Manager and the Contracting Officer.]

#### 3.6.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants and oil shall be managed and stored in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. [There shall be no storage of fuel on the project site. Fuel must be brought to the project site each day that work is performed.] [Storage of fuel on the project site shall be accordance with all Federal, State, and local laws and regulations.]

#### 3.6.5 Waste Water

Disposal of waste water shall be as specified below.

- a. Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related waste water [off-Government property in accordance with all Federal, State, Regional and Local laws and regulations.] [or by collecting and placing it in a retention pond where suspended material can be settled out and/or the water can evaporate to separate pollutants from the water. The site for the retention pond shall be coordinated and approved with the Contracting Officer. The residue left in the pond prior to completion of the project shall be removed, tested, and disposed off-Government property in accordance with Federal, State, and local laws and regulations. The area shall be backfilled to the original grade, top-soiled and seeded/sodded. [The water in the retention pond shall be tested for [\_\_\_\_] and the results reviewed and approved by the Contracting Officer, prior to being discharged or disposed off-Government property].]
- b. For discharge of ground water, the Contractor shall [obtain a State or Federal permit specific for pumping and discharging ground water prior to surface discharging.] [surface discharge in accordance with all Federal, State, and local laws and regulations.] [surface discharge in accordance with the requirements of the NPDES or State STORM WATER DISCHARGES FROM CONSTRUCTION SITES permit.] [land apply on the project site. Land application shall be in accordance with all Federal, State, Regional, and/or Local laws and regulations for pumping and land applying ground water.]

c. Water generated from the flushing of lines after [disinfection or disinfection in conjunction with hydrostatic testing] [hydrostatic testing] shall be [land applied in accordance with all Federal, State, and local laws and regulations for land application] [discharged into the sanitary sewer with prior approval and/or notification to the Waste Water Treatment Plant's Operator].

#### 3.7 RECYCLING AND WASTE MINIMIZATION

The Contractor shall participate in State and local government sponsored recycling programs. [The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.] [The Contractor shall participate in the following recycling and waste minimization activities to divert non-hazardous solid waste:[\_\_\_\_]].

# 3.8 NON-HAZARDOUS SOLID WASTE DIVERSION REPORT

The Contractor shall maintain an inventory of non-hazardous solid waste diversion and disposal of construction and demolition debris. The Contractor shall submit a report to [\_\_\_\_] through the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that non-hazardous solid waste has been generated. The following shall be included in the report:

- a. Construction and Demolition (C&D) Debris Disposed = [\_\_\_\_] in cubic meters, as appropriate.
- b. Construction and Demolition (C&D) Debris Recycled = [\_\_\_\_] in cubic meters, as appropriate.
- c. Total C&D Debris Generated = [\_\_\_\_] in cubic meters, as appropriate.
- d. Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount) = [\_\_\_\_] in cubic meters, as appropriate.

# 3.9 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

[Existing historical, archaeological, and cultural resources within the Contractor's work area are shown on the drawings. The Contractor shall protect these resources and shall be responsible for their preservation during the life of the Contract. ] If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

#### 3.10 BIOLOGICAL RESOURCES

The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

## 3.11 INTEGRATED PEST MANAGEMENT

In order to minimize impacts to existing fauna and flora, the Contractor, through the Contracting Officer, shall coordinate with the Installation Pest Management Coordinator (IPMC)Project Pesticide Coordinator (PPC) at the earliest possible time prior to pesticide application. The Contractor shall discuss integrated pest management strategies with the [IPMC] [PPC] and receive concurrence from the [IPMC] [PPC] through the COR prior to the application of any pesticide associated with these specifications. Installation Project Office Pest Management personnel shall be given the opportunity to be present at all meetings concerning treatment measures for pest or disease control and during application of the pesticide. [For termiticide requirements see Section 02364 TERMITICIDE TREATMENT MEASURES FOR SUBTERRANEAN TERMITE CONTROL.] The use and management of pesticides are regulated under 40 CFR 152 - 186.

## 3.11.1 Pesticide Delivery and Storage

Pesticides shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses. Pesticides shall be stored according to manufacturer's instructions and under lock and key when unattended.

#### 3.11.2 Oualifications

For the application of pesticides, the Contractor shall use the services of a subcontractor whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed.

## 3.11.3 Pesticide Handling Requirements

The Contractor shall formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions and shall use the clothing and personal protective equipment specified on the labeling for use during all phases of the application. Material Safety Data Sheets (MSDS)shall be available for all pesticide products.

## 3.11.4 Application

Pesticides shall be applied by a State Certified Pesticide Applicator in accordance with EPA label restrictions and recommendation. The Certified Applicator shall wear clothing and personal protective equipment as specified on the pesticide label. Water used for formulating shall only come from locations designated by the Contracting Officer. The Contractor shall not allow the equipment to overflow. Prior to application of pesticide, all equipment shall be inspected for leaks, clogging, wear, or damage and shall be repaired prior to being used.

## 3.12 PREVIOUSLY USED EQUIPMENT

The Contractor shall clean all previously used construction equipment prior to bringing it onto the project site. The Contractor shall ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. The Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

#### 3.13 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

#### 3.14 MILITARY MUNITIONS

In the event the Contractor discovers or uncovers military munitions as defined in 40 CFR 260, the Contractor shall immediately stop work in that area and immediately inform the Contracting Officer.

#### 3.15 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Additional meetings shall be conducted for new personnel and when site conditions change. The training and meeting agenda shall include: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

## 3.16 CONTAMINATED MEDIA MANAGEMENT

Contaminated environmental media consisting of, but not limited to, ground water, soils, and sediments shall be managed in accordance with Section [ ].

#### 3.17 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". The Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area shall be graded, filled and the entire area seeded unless otherwise indicated.

-- End of Section --

#### SECTION 01451

# CONTRACTOR QUALITY CONTROL 04/97

#### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1999b) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1998a) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

## 1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

The Contractor is solely responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

## 3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, not later than 20 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

## 3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES. Section 01330 SUBMITTAL PROCEDURES will be provided with each Task Order issued.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These

procedures shall establish verification that identified deficiencies have been corrected.

- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

## 3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

## 3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

#### 3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

## 3.4 QUALITY CONTROL ORGANIZATION

## 3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times

during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, show drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

## 3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer or an experienced construction person, with a minimum of five years construction experience as a CQCon construction similar to this contract. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

## 3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: civil, structural, environmental, architectural, materials technician, submittals /RMS clerk, and occupied family housing coordinator. These individuals shall be directly employed by the prime Contractor and may not be employed by a supplier or sub-contractor on this project; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; and have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals shall have no other duties other than quality control.

## Experience Matrix

	Area	Qualifications
a.	Civil	Graduate Civil Engineer with 2 years experience in the type of work being performed on this project or technician with 5 yrs related experience
b.	Architectural	Graduate Architect with 2 yrs experience or person with 5 yrs related experience
C.	Environmental	Graduate Environmental Engineer with 3 yrs experience

#### Experience Matrix

	Area	Qualifications
d.	Submittals/RMS Coordinator	Submittal Clerk with 1 yr experience. RMS training and 2yrs experience
е.	Occupied family housing	Person to coordinate availability and turnover of units, track deficeincies and warrranty items on units turned over, customer relations experience, coordinator experience
f.	Concrete, Pavements and Soils	Materials Technician with 2 yrs experience for the appropriate area

## 3.4.4 Additional Requirement

In addition to the above experience and/or educational requirements, the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractor" within the past five years and shall be in possession of a valid certificate of instruction. If the individual designated as CQC System Manager does not currently meet this training requirement, it is mandatory that the training be successfully completed within ninety calendar days of appointment to the position of CQC System Manager. The Contractor's CQC System Manager may be appointed and serve fully in that capacity pending certification, providing all other qualifications are met. If the CQC System Manager fails to successfully complete the training, the Contractor shall promptly appoint a new CQC System Manager who shall then attend the next available course if he/she does not have a current course certification. The Certification is valid for five years at which time retraining is required. If the Contractor needs this training, it will be provided by Government personnel after award of the contract. The cost for the training course shall be borne by the Contractor and will not exceed one hundred dollars (\$100.00) per course, per person. Payment shall be by check in advance of the training. The Contractor shall contact the Contracting Officer upon award of the contract to arrange for course participation.

## 3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

#### 3.5 SUBMITTALS

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

#### 3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

## 3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to

the acceptable level of workmanship required in order to meet contract specifications.

## 3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

## 3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

## 3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

## 3.6.5 CONCEALED WORK

All items of work to be concealed shall be Government inspected prior to concealment. Contractor shall notify the Contracting Officer's representative of his/her intention to conceal twenty-four (24) hours in

advance and no items shall be concealed until the Contractor has received approval to do so.

## 3.6.6 Housing Quality Verification Checklist

The Contractor shall verify the quality of all work during the Preparatory, Initial and Follow-up Phase. Verification of quality on housing shall include a checklist. A Quality Verification Checklist shall be prepared and submitted for review as part of the CQC Plan. Quality control checks shall be performed for each definable feature of work.

At the end of this Specification Section is a sample Housing Quality Verification Checklist. It includes a sample list of definable features of work. It is not meant to represent the minimum nor maximum features of work that will be on the accepted list for this project. Included under each definable feature of work are sample listings of quality control checks. These inspection item checks are samples only and are not intended to be all inclusive. The CQC Plan shall include quality controlinspection checks related to each definable feature of work. For each building and each unit, the Contractor shall provide a completed checklist which certifies that the work complies with the drawings and specifications. The completed checklist shall be submitted with the QC report.

#### 3.7 TESTS

#### 3.7.1 Testing Procedure

Wherever testing or analysis of materials is called for in these specifications, such testing, unless otherwise noted, shall be made at the Contractor's expense, using Contractor supplied equipment. The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Tests shall be made at the Contractor's expense by commercial testing laboratories approved in writing by the Contracting Officer or his/her designated representative. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date

taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

## 3.7.2 Testing Laboratories

## 3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

## 3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of \$3,500 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

## 3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

## 3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b., at the following address:

For delivery by mail:

USACE Research and Development Center ATTN: Joe Tom, CEERD-SC-E 3909 Halls Ferry Road Vicksburg, MS 39180-6199

For other deliveries: Same as above.

Coordination for each specific test, exact delivery location, and dates will be made through the Area Office.

## 3.7.5 Subsequent Testing

Subsequent testing of those materials which fail to meet specifications shall also be accomplished by the Contractor at no additional cost to the Government.

## 3.7.6 Failure Tests

Any item, for which test reports show failure to meet all contract requirements, shall be retested as often as required to show full compliance with contract requirements, at the Contractor's expense. If the Contracting Officer or his/her designated representative so requires, items which fail on testing to meet requirements shall be rejected, replaced with new items of other manufacturer or source, and shall then be retested in place thereof, at the Contractor's expense.

## 3.8 COMPLETION INSPECTION

## 3.8.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Special Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

## 3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

## 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Written notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

#### 3.8.4 DISCREPANCIES

It shall be the Contractor's responsibility to correct all discrepancies and request reinspection of the facility. Work shall not be accepted until all work on the facility under construction is complete and any discrepancies are corrected to the Government's satisfaction. The original of all Final Inspection Records shall be retained by the Contracting Officer or his/her designated representative. The final invoice and release of claims shall not be submitted until As-Builts have been submitted and approved by the Contracting Officer.

## 3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
- g. Offsite surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work

period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

#### 3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

# SPEC WRITER: INCLUDE THIS CHECKLIST IN HOUSING PROJECTS IN MISSOURI Housing Quality Verification Checklist

(Example of Definable Feature of Work): Building Layout

(Examples of Quality Control Checks)

Check building setback requirements.

Verify building elevations.

Verify benchmark.

## Strip Site

Check for protection of existing utilities, vegetation, and structures before operations begin.

Check segregation of topsoil from backfill.

Check requirements for erosion control.

## Foundation Excavation

Check for contractor's location, identification and necessary protection of existing site utilities, vegetation, and existing structures before operations begin.

Digging permits.

Building setback.

Removal of unsatisfactory materials.

Check excavation, dewatering.

Erosion control.

Use of satisfactory materials for backfill.

Compliance with compaction requirements.

Required testing of backfill.

Condition of subgrade (compaction, moisture, finish).

## Underslab Plumbing

Water Supply and Distribution

Check that piping materials comply with requirement for under slab location.

Check that there are no pipe joints below building slab.

Check size and depth of water line service.

Check sleeve requirements.

Check separation requirements of sewer and water line.

Test piping prior to follow-on work.

Sanitary Drainage

Check that piping materials comply with requirement for under slab location.

Check size of waste line.

Check slope.

Check separation requirements of sewer and water line.

Check for drainage pattern type fittings.

Check requirements for building sewer clean out.

Check type, size, location, and elevation of floor drains.

Test piping prior to follow-on work.

Radon Piping

Check for approved materials.

Check layout.

Check penetrations thru foundation.

#### Soil Treatment

Pesticide labels to bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Check handling, mixing, application requirements of pesticide.

Check disposal requirements of containers and residual pesticide.

Check the requirement for soil poisoning under and around building structures.

Check for approval of material to be used and watch specifically for required concentration.

Check application for coverage and quantity of material used.

Check EPA requirements.

Check MSDA sheets.

#### Slab-on-grade

Check capillary water barrier, gradation, depth, consolidation.

Is vapor barrier membrane of specified thickness?

Check vapor barrier edges for specified lap. Check requirement for sealing the edges.

Check that vapor barrier joints and penetrations are sealed with tape.

Check reinforcing steel required by plans and/or shop drawings.

Check reinforcing supports.

Check forms.

Check footing depth and width.

Clearance of steel from forms and subgrade, and support material.

Location and construction of contraction and expansion joints.

Concrete tests - slump, entrained air content, temperature, strength.

Concrete placement - vibration/consolidation.

Concrete finish.

Check form removal. Check patching.

Check protection and curing of concrete.

Check materials, dimensions, and installation of perimeter insulation.

## Wall Framing & Ext. Sheathing

Lumber Grading

Species and grade for particular use comply with the specifications.

Check for grade stamp.

Defects in material do not exceed grading rules.

Lumber Seasoning and Storage Check moisture content of wood. Check for proper storage of materials.

Fasteners

Nailing complies with the AFPA Manual for Wood Frame Construction.

Protection Against Termites and Decay

Check for pressure preservative treated wood where wood is resting on concrete which is in contact with the ground.

Wood supports and nailers which support permanent structures and which are embedded in concrete in direct contact with earth or exposed to the weather, should be pressure preservative treated.

Check that treated lumber in contact with concrete that contacts the ground is treated to a retention level of 0.40. Check grade stamp.

Anchorage of Sills and Plates to Foundation

Foundation plates or sills shall be bolted to the foundation or foundation wall with not less than ?-inch nominal diameter steel bolts embedded at least 7 inches into concrete and spaced not more than 6 feet apart. Check plans and specifications for other requirements.

Check that there are a minimum of two bolts per piece with one bolt located within 12 inches of each end of each piece.

Check for a properly sized nut and washer tightened on each bolt to the plate.

Check special requirements for shear walls.

Check hold down anchors.

Wall and Partition Framing

Check stud spacing.

Double top plates for bearing walls and bearing partitions.

Horizontal blocking.

All openings are framed.

Solid blocking provided for hanging of fixtures, handrails, cabinets, baseboard and similar items.

Headers are sized properly.

Top plate corners overlap.

Top plate end joints offset as specified (or 48 inches by UBC).

Check for defects in studs beyond allowable.

Notches in exterior wall studs or bearing partition do not exceed 25 percent of its width.

Notches in nonbearing partition do not exceed 40 percent of its width.

Borings in any stud do not exceed 40 percent of the stud width.

Borings are not greater than 60 percent of the width of the stud in nonbearing partitions or in any wall where each bored stud is doubled, and no more than two such successive doubled studs are so bored.

The edge of bored holes are no closer than ? inch to the edge of the stud and the hole is not located in the same section of stud as a cut or notch.

Check special requirements for shear walls.

Check hold down anchors.

Wood Framed Floor

Notches or holes in joists are not cut in the middle one-third of the joist span.

Notches in the outer sections of the span are no greater than one-sixth the joist depth.

Notches at joist end for ledger support are no greater than one-forth the joist depth.

Holes in the outer joist sections are limited in diameter to one-third the joist depth and are cut with the edge of the hole no closer than 2 inches to the top or bottom edges.

Where bearing partitions are parallel to floor joists, double joist should be directly under the partition.

Where walls containing plumbing are parallel to floor joists, the joist underneath are doubled, spaced and blocked to permit the passage of pipes.

Joist hangers and nails are the correct size for supported member.

Joists on wood plates bear a minimum of 1? inches.

Joists on concrete bear a minimum of 3 inches.

Floor systems having joists framing from opposite sides over a bearing support are tied together by lapping a minimum of 3 inches.

Ends of floor joists are blocked full depth.

Exterior Wall Sheathing

Check for required diagonal bracing.

Check for sheathing against specification requirements for type of material, thickness, width, and length.

Nails and spacing as specified?

Proper orientation of sheathing.

End joints over framing members.

Check requirements for air infiltration barrier.

#### Roof Trusses & Sheathing

Roof Trusses

Check requirements for storage, handling, and installation in accordance with  $\mbox{TPI HIB-91}$ .

Check moisture content of wood.

Ensure trusses are not field altered.

Check shop drawings for bearing points of trusses. Trusses should not be nailed to interior partitions at non-load bearing locations.

Are provisions to allow the bottom chord to float at interior walls required? Check for truss clips.

Check shop drawings for tie straps and hangers.

Check shop drawings for bracing of top and bottom chords. Check bracing of web members.

Roof Sheathing

Check sheathing for type, grade, and thickness required.

Check for required space at plywood joints.

Check sizes, length, and spacing of fasteners.

Check that long dimension of structural panels are perpendicular to rafters with panel continuous over two or more spans.

Check that joints are staggered.

Check requirement for panel clips.

#### Roof Shingles

Check for approved materials.

Shingles are labeled as UL approved.

Sheathing is smooth, firm, dry, and free from loose boards.

Pipe and other roof penetrations are properly flashed.

Flashing is installed or on hand to be installed concurrently with roofing.

Ensure compliance with roofing manufacturer's instructions regarding:

underlayment, fasteners (type and location), drip edge, starter course,

successive courses, hip and ridge shingles, flashing, valley construction.

Underlayment on top of metal drip edge at eaves.

Metal drip edge on top of underlayment at rake.

#### Install HVAC Ducts

Fabrication and Erection

Check that ductwork delivered to the site conforms with approved shop drawings.

Check sheet metal material type, thickness and shape.

Check flexible duct type and size.

Check workmanship of lock seams of sheet metal ducts.

Check gauge of dampers and splitters.

Check for framed openings or duct sleeves in wall penetrations where required.

Examine duct hangers for specified material, thickness, and spacing.

Check flexible connections where required.

Test ducts for air tightness prior to follow-on work as required.

Insulation

Check the type and thickness of insulation and requirements for vapor barrier.

Check the method of fastening insulation to exterior or interior of duct. Check fasteners or adhesives.

Check sealing requirements of insulation vapor retarder.

Check for continuity of insulation through walls and floor, if required.

Check materials for fire-retardant requirements.

#### Electrical and Communication Rough-In

General Requirements

Notches in exterior wall studs or bearing partition do not exceed 25 percent of its width.

Notches in nonbearing partition do not exceed 40 percent of its width.

Borings in any stud do not exceed 40 percent of the stud width.

Borings are not greater than 60 percent of the width of the stud in nonbearing partitions or in any wall where each bored stud is doubled, and no more than two such successive doubled studs are so bored.

The edge of bored holes are no closer than ? inch to the edge of the stud and the hole is not located in the same section of stud as a cut or notch.

Notches or holes in joists are not cut in the middle one-third of the joist span.

Notches in the outer sections of the span are no greater than one-sixth the joist depth.

Holes in the outer joist sections are limited in diameter to one-third the joist depth and are cut with the edge of the hole no closer than 2 inches to the top or bottom edges.

Bored holes in wood wall framing: Check requirements for minimum distance of wire to edge of wood member (?1? inches). Check requirements if minimum distance cannot be maintained.

Notches in wood wall framing: Check requirements for protection of wires thru notches in wood members.

Where a service raceway enters from an underground distribution system, check that it is sealed. (NEC 230-8)

General Purpose Circuits

Check that outlet boxes comply with specifications for material.

Check duplex receptacles for location and spacing.

Check that hallways ?10 feet have a receptacle.

Check offset requirements of boxes on opposite sides of fire rated partitions and walls. Check fire sealing requirements on fire rated partitions and walls.

Check requirements for clearance of non-insulated cover recessed light

fixtures (3 inches from insulation, ? inch to combustibles).

Check support requirements for ceiling boxes for mounting lighting fixtures.

Check mounting requirements of boxes in relation to finished surface of wall/ceiling.

Check height of receptacles, switches, and HVAC controls. Check special height requirements for accessibility in accordance with the Uniform Federal Accessibility Standards.

Check that boxes are not overcrowded with conductors.

Utility

Check requirements for hot water heater, heat pump, washer and dryer. Check conductors and circuits.

Check that at least one 20-amp branch circuit is provided to the laundry. (NEC 220-4c and 210-52f)

Kitchen Circuits

Check spacing of outlets.

Check requirement for 20-amp small appliance circuits.

Appliances

Check electric range conductor.

Check garbage disposal and dishwasher wiring.

Outlet location for garbage disposal shall permit disposal cord to be less than 36 inches (minimum length of cord is 18 inches).

Outlet location for dishwasher shall permit dishwasher cord to be less than 4 feet (minimum length of cord is 3 feet).

Check that outlet locations for appliances are accessible.

Wiring

Check type of insulation and jacket, conductor material, conductor size and stranding in each circuit.

Sheathing to extend no less that ? inch into box.

Check that wire is clamped to box if required.

Protective cable plates required where wires are within 1? inch of edge of stud.

Check that wire is stapled within 12 inches of cabinets, boxes, and fittings and secured at intervals not to exceed 4? feet.

Check that wire installed in attics are protected within 6 feet of the attic entrance.

Grounding Electrode System

Check requirements for size and type of grounding electrode conductor.

Check for approved clamp to water service.

Check for approved rod connection for contact with soil.

Check size, length, and material of ground rods or electrodes against contract drawings and specifications.

Check special requirements for grounding of equipment. Check grounding resistance.

Meter Main

Check for approved materials.

Check meter height.

Panelboard

Check that circuits are labelled.

Check that breakers are make and model per panel labeling.

Check that unused openings are properly closed.

Check for required clearances in front of panel.

Check that maximum breaker height is does not exceed 6 ft. 6 inches.

Windows/Exterior Doors

Check for approved products.

Check that door hardware complies with specifications.

Verify manufacturer's installation requirements. Fasteners, sealant, and shims as required.

Check that exterior door jambs are rabbeted from a solid board to provide an integral stop.

Check door clearance, top, sides, and bottom.

Check operation of doors and windows.

Check for approved garage door and hardware. Check operation of garage door and hardware.

Check for accessible doors where required. Doors to comply with the Uniform Federal Accessibility Standards.

Check fire rating requirement of door from garage to unit.

## Plumbing Rough-In

General Requirements

Notches in exterior wall studs or bearing partition do not exceed 25 percent of its width.

Notches in nonbearing partitions do not exceed 40 percent of its width.

Borings in any stud do not exceed 40 percent of the stud width.

Borings are not greater than 60 percent of the width of the stud in nonbearing partitions or in any wall where each bored stud is doubled, and no more than two such successive doubled studs are so bored.

The edge of bored holes are no closer than ? inch to the edge of the stud and the hole is not located in the same section of stud as a cut or notch.

Notches or holes in joists are not cut in the middle one-third of the joist span.

Notches in the outer sections of the span are no greater than one-sixth the joist depth.

Holes in the outer joist sections are limited in diameter to one-third the joist depth and are cut with the edge of the hole no closer than 2 inches to the top or bottom edges.

Where plumbing, heating or other pipes are placed in or partly in a partition, necessitating the cutting of the soles or plates, a metal tie not less than 0.058 inches (16 galvanized gage) and 1? inches wide shall be fastened to each plate across and to each side of the opening with not less than six 16d nails.

Check for fire sealing thru fire rated walls and partitions.

Check supports for tub enclosure.

Check piping and fixture supports.

Test piping prior to follow-on work.

Water Supply and Distribution

Check that piping materials comply with requirements.

In multi-unit buildings, check that separate water shut off is provided for each unit. These valves shall be accessible in the unit that they control.

Check that valves are oriented with stems in horizontal position or above. Check flow orientation of globe valves.

Check for drain fitting at service entrance if required.

Check required locations for water hammer arrestors and air chambers. Check for access to water hammer arrestors.

Check for required air gaps and vacuum breakers.

Check pipe joints.

Check pipe sizes.

Sanitary Drainage

Check that piping materials comply with requirements.

Check for required cleanouts and traps.

Check pipe joints.

Check pipe and trap sizes.

Check slope.

Vents

Check that piping materials comply with requirements.

Check pipe sizes, joints, and slope.

Check that vents rise vertically to a point not less than six (6) inches above the flood level rim of the fixture served before offsetting horizontally.

Check that the plumbing fixture's maximum trap arm length will not be exceeded.

Check minimum size of vent thru roof.

Check height of vent above roof.

Check location of vent thru roof in relation to windows and vertical surfaces.

Traps and Trap Arms

Check pipe size, joints, slope, and trap size.

Ensure that the vent opening is at or above the level of the weir of the trap it serves.

Check that the plumbing fixture's maximum trap arm length will not be exceeded.

Ceiling & Wall Insulation

Check that material has been submitted and approved.

Check that other trades that might damage the insulation or vapor retarder are finished prior to installation of the insulation materials.

Check for proper placement of vapor retarder.

Lap and seal edges and ends of vapor retarder.

Check loose fill insulation for required thickness.

Where interior partitions abut exterior walls, check that insulation and vapor retarder is provided at intersection.

Hang Drywall on Wood Framing

Delivery and Storage

Check that materials meet the specification and are in good condition.

Gypsum wallboard should be stored flat, off the floor and supported to prevent sagging. Protect from moisture and damage.

Framing members and wall assembly are to be protected from moisture. Check environmental pre-conditioning and installation requirements.

Ceiling Framing

Check alignment of members.

Check for required backing. All edges of gypsum wallboard are to be supported.

Where truss uplift is a concern, check for backing/fasteners for floating corners at non-bearing interior walls and ceiling. Provide truss clips on bottom chord of truss where required to allow for movement.

At ceiling joists where wiring passes through borings in wood members less than 1? inches from the edge of the member, it shall be protected by a steel plate at least 1/16 inch thick. Holes are not allowed through truss members.

Wall Framing

Where plumbing, heating or other pipes are placed in or partly in a partition, necessitating the cutting of the soles or plates, a metal tie not less than 0.058 inches (16 galvanized gage) and 1? inches wide shall be fastened to each plate across and to each side of the opening with not less than six 16d nails.

Where wiring passes through borings in wood members less than 1? inches from the edge of the member, it shall be protected by a steel plate at least 1/16 inch thick.

Check alignment of framing. Check that walls are straight and true.

Check stud spacing and required blocking.

Check for twisted studs, protruding blocking, soil pipes, and other items that would create an uneven surface.

Check that moisture content of wood members does not exceed 15% at time of gypsum wallboard application.

Check for drywall stops or corner blocking for fastening at interior corners.

Ceiling Installation

Check for vapor barrier if required.

Where moisture resistant gypsum wallboard is required, omit vapor barrier.

Verify that material being used complies with specifications and requirements of fire or sound rating.

Check for high strength gypsum wallboard if required.

Make sure proper perpendicular or parallel application of board is used, and the end joints are staggered.

Check fasteners and spacing. Check adhesive if required.

Check for proper application of floating interior corners.

Where truss uplift is a concern, check for proper attachment of gypsum wallboard to bottom chord of truss. Allow for floating interior corners.

Wall Installation

Check for vapor barrier if required.

Where moisture resistant gypsum wallboard is required, omit vapor barrier.

Apply approved mastic to all cut or exposed panel edges at utility holes, joints, and intersections of moisture resistant gypsum wallboard.

Verify that material being used complies with specifications and requirements of fire or sound rating.

Make sure proper perpendicular or parallel application of board is used, and the end joints are staggered.

Check fasteners and spacing. Check adhesive if required.

Check that fasteners are at least ? inch from edges and ends.

Ensure that fasteners are applied starting from the center of board and working to ends and edges.

Check for proper application of floating interior corners.

#### Finish Drywall

Check that materials meet the specification (taping and embedding compound, joint tape, finishing compound, drywall corner bead, control joints).

Check that corner beads are one piece.

Check that surfaces to receive joint compound are free of dirt, oil and other materials that would effect bond.

Check that joint tape is placed over sufficient joint compound to ensure bond.

Check that at least two coats of finishing compound are applied after tapping and embedding compound.

Install Heat Pump & HW Heater

Check for approved equipment.

Check BTU ratings, capacity, recovery, etc.

Check for required locations of dielectric connections.

Check condensate requirements for size, trap, and air gap.

Check for required disconnect switch.

#### Paint Interior Walls

Test reports of submitted paints comply with specifications.

Check requirements for storage of paint.

Check for protection of unpainted adjacent surfaces.

Worker protection controls are in place.

Check surfaces prior to painting. Need to be clean and free of foreign matter.

Exposed ferrous metals are spot primed.

Check that new gypsum wallboard is primed.

Ensure gypsum wallboard compound has cured as required.

Check ambient temperature.

Check preparation of previously painted surfaces.

Check that required number of coats and thickness is obtained.

Ensure uniform coverage.

## Install and Paint Interior Doors and Trim

Check for approved products.

check storage of products. Protect from extremes of temperature and humidity.

Wood door edges to be sealed prior to shipment.

Check that exterior door jambs are rabbeted from a solid board to provide an integral stop.

Check for required wedge blocking between frame and rough opening.

Installation to comply with manufacturer's instructions and specifications.

Check door clearance, top, sides, and bottom.

Check that finishes are applied in accordance with the specifications.

Check that internal parts of electrical equipment are free from paint, plaster, or other materials. (NEC 110-12c)

#### Cabinets & Trim

Check storage of cabinets.

If required, check for KCMA Certification Seal.

Check construction details of cabinets.

Check finish of cabinets.

Check alignment for level and plumb installation.

Anchors and fasteners installed at required intervals and locations.

Check counter laminate thickness. Check counter substrate thickness and material.

Countertops attached at required locations.

Install Plumbing Fixtures, HVAC Devices, Electrical Fixtures and Devices

Plumbing Fixtures

Check for approved fixtures.

Check condition of fixtures.

Installation in accordance with specifications and installation instructions.

Traps and Trap Arms

Check pipe size, joints, slope, and trap size.

Electrical Devices and Fixtures

Check receptacles for compliance with the specifications.

Check alignment of receptacles.

Check for GFCI where required.

Check for approved fixtures.

Test fixtures.

Diffusers, Registers and Grills

Check for approved materials.

Check for proper operation of registers and diffusers.

HVAC Balancing and Testing

Perform air balancing and sound tests of HVAC system.

Perform test of heat pump system.

Smoke Detectors

Check for approved devices.

Test operation of devices.

#### Resilient Floor and Carpet

Concrete Floor

Check that concrete is smooth and level. Check that defects are repaired.

Check for leveling compound where needed.

Perform dryness test if required.

Framed Floor

Check for approved underlayment. Check material, grade, and thickness.

Check for approved fasteners and spacing.

Check that underlayment joints are offset from parallel subflooring joints.

Check that surfaces, including joints and fastener locations, are smooth for finish flooring.

Resilient Flooring and Base

Check storage area for required temperature and low humidity.

Check that resilient flooring, edge strips, and adhesive is approved.

Check thickness and width of flooring material.

Ensure required temperature is maintained prior to and after installation of flooring materials.

Ensure that newly installed flooring is cleaned in accordance with the specifications.

Provide protection of flooring from damage.

Carpet and Base

Check for approved materials.

Ensure required temperature is maintained prior to and after installation of flooring materials.

Check thickness of carpet and carpet cushion.

Check installation in accordance with manufacturer's instructions and CRI 104.

Check orientation of seams.

Ensure that newly installed carpet is cleaned in accordance with the specifications.

Provide protection of carpet from damage.

Siding & Soffit

Check for approved siding and accessories.

Check storage of siding.

Installation of accessories, starter strip, corners, trim.

Check siding thickness.

Verify flashing.

Approved fasteners.

Check for approved sealant.

Siding installed in accordance with approved erection instructions and drawings.

## Gutters & Downspouts

Check materials against specification requirements for type of material, thickness, finish, size.

Check slope of gutters to provide drainage to outlets.

Check brackets and spacers for size, type, location, and spacing.

#### Paving & Sidewalks

Removal of unsatisfactory materials.

Check excavation, dewatering.

Erosion control.

Use of satisfactory materials for backfill.

Compliance with compaction requirements.

Required testing of backfill.

Condition of subgrade (compaction, moisture, finish).

Compaction of aggregate base.

Forms.

Check reinforcing steel required by plans and/or shop drawings.

Check footing thickness and width.

Check thickness of sidewalks, porches and patios.

Concrete mix - strength.

Clearance of steel from forms and subgrade, and support material.

Location and construction of contraction and expansion joints.

Concrete placement - slump, vibration, and finish.

Concrete finish.

Concrete curing.

Location and care of imbedded items.

#### Exterior Paint

Test reports of submitted paints comply with specifications.

Check requirements for storage of paint.

Check surfaces prior to painting. Need to be clean and free of foreign matter.

Exposed ferrous metals are spot primed.

Check that required number of coats and thickness is obtained.

Ensure uniform coverage.

Wood surfaces are prepared and finished in accordance with the specifications.

-- End of Section --

#### SECTION 01500A

# TEMPORARY CONSTRUCTION FACILITIES 02/97

## PART 1 GENERAL

#### 1.1 GENERAL REQUIREMENTS

#### 1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

## 1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display, identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

## 1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

## 1.2 AVAILABILITY AND USE OF UTILITY SERVICES

## 1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

## 1.2.2 Meters and Temporary Connections

The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary

connections, distribution lines, and meter bases (Government will provide meters) required to measure the amount of each utility used for the purpose of determining charges. The Contractor shall notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. The Contractor shall not make the final electrical connection.

## 1.2.3 Advance Deposit

An advance deposit for utilities consisting of an estimated month's usage or a minimum of \$50.00 will be required. The last monthly bills for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed to the Contractor prior to the end of the current fiscal year.

#### 1.2.4 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, the Contractor shall notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. The Contractor shall then remove all the temporary distribution lines, meter bases, and associated paraphernalia. The Contractor shall pay all outstanding utility bills before final acceptance of the work by the Government.

#### 1.2.5 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel. Workmen shall not be permitted to use Government toilet facilities in existing buildings.

## 1.2.6 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

## 1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

#### 1.3.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board on each active phase of construction, not less than 915 by 1220 mm in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

## 1.3.2 Project and Safety Signs

The requirements for the signs, their content, and location shall be as shown on the drawings at the end of this section. The signs shall be erected within 15 days after receipt of the notice to proceed for each phase of construction. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Signs shall be erected on and placed on each active phase of construction. NOTE: On the project sign schedule, the Contractor shall add the following items:

SPACE	HEIGHT	LINE	DESCRIPTION	LETTER HEIGHT	STROKE
H T	2" 2"	8	BOD: Ribbon Cutti	1.5"	3/16"
_	-		Date:	1.5"	3/16"

Upon completion of the project, the signs shall be removed from the site.

#### 1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

#### 1.4.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

#### 1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary

to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

## 1.5 CONTRACTOR'S TEMPORARY FACILITIES

#### 1.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel. When the location of work moves from the Midland housing area to the Woodside housing area, the Contractor shall be responsible for relocating the administrative field office facilities to the Woodside site.

## 1.5.2 Storage Area

The Contractor shall construct a temporary 1.8 m high chain link fence around trailers and materials. The fence shall include plastic strip inserts, colored brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

## 1.5.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

## 1.5.4 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

## 1.5.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established

roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

## 1.5.6 New Building

In the event a new building is constructed for the temporary project field office, it shall be a minimum 3.6 m in width, 5 m in length and have a minimum of 2.1 m headroom. It shall be equipped with approved electrical wiring, at least one double convenience outlet and the required switches and fuses to provide 110-120 volt power. It shall be provided with a work table with stool, desk with chair, two additional chairs, and one legal size file cabinet that can be locked. The building shall be waterproof, shall be supplied with heater, shall have a minimum of two doors, electric lights, a telephone, a battery operated smoke detector alarm, a sufficient number of adjustable windows for adequate light and ventilation, and a supply of approved drinking water. Approved sanitary facilities shall be furnished. The windows and doors shall be screened and the doors provided with dead bolt type locking devices or a padlock and heavy duty hasp bolted to the door. Door hinge pins shall be non-removable. The windows shall be arranged to open and to be securely fastened from the inside. Glass panels in windows shall be protected by bars or heavy mesh screens to prevent easy access to the building through these panels. In warm weather, air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 11 degrees C below the outside temperature when the outside temperature is 35 degrees C, shall be furnished. Any new building erected for a temporary field office shall be maintained by the Contractor during the life of the contract and upon completion and acceptance of the work shall become the property of the Contractor and shall be removed from the site. All charges for telephone service for the temporary field office shall be borne by the Contractor, including long distance charges up to a maximum of \$75.00 per month.

## 1.5.7 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

## 1.6 GOVERNMENT FIELD OFFICE

#### 1.6.1 ACCOMMODATIONS FOR GOVERNMENT INSPECTORS

The Contractor shall provide the Government Inspectors with an office, approximately 19 square meters in floor area, located where directed and providing space heat, air-conditioning, adequate electric lighting and power, drinking water facilities, and toilet facilities consisting of one lavatory and one water closet complete with connections to water and sewer mains. The office shall be furnished with one legal size filing cabinet with four drawers, one drafting table with stool, one plan rack, one desk, and three chairs. Used furniture, in good condition, will be acceptable. Entrance doors shall be equipped with a substantial lock. The contractor shall provide janitor service, fuel for the heating facilities, electricity, two telephone lines and water, all at no cost to the Government, except the Contractor will not be liable for Government

long-distance calls. A mail slot in the door or a lockable mail box mounted on the surface of the door shall be provided. At completion of the project, the office shall remain the property of the Contractor and shall be removed from the site. Utilities shall be connected and disconnected in accordance with local codes and to the satisfaction of the Contracting Officer. When the location of work moves from the Midland housing area to the Woodside housing area, the Contractor shall be responsible for relocating the Accommodations for government inspectors to the Woodside site.

## 1.6.2 Trailer-Type Mobile Office

The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above. The trailer shall be securely anchored to the ground at all four corners to guard against movement during high winds.

#### 1.7 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor shall install a satisfactory means of communication, such as telephone or other suitable devices. The devices shall be made available for use by Government personnel.

#### 1.8 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall consist of high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 1.1 m high, steel posts, and two tension wires, top and bottom. The fence fabric shall be supported and tightly secured to steel posts, located on maximum 3 m centers, and the top and bottom tension wires, located 6 inches above grade and 6 inches below top of fabric, constructed at the approved location. Contractor shall reconfigure fencing to match phased turn over of units. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

#### 1.9 CLEANUP AND DISPOSAL OF DEBRIS

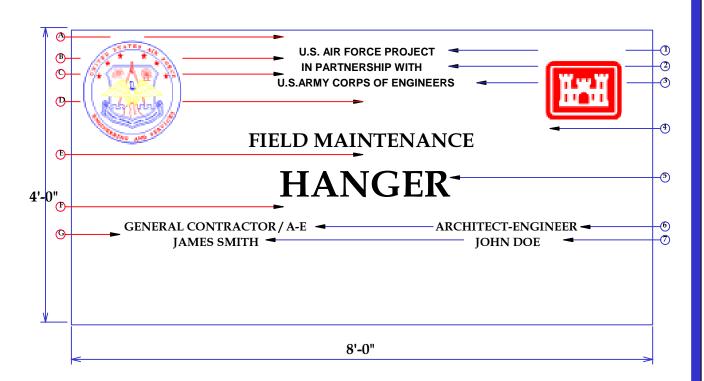
At the end of each work day, the Contractor shall clean the work area and stack building materials in a neat manner as approved by the Contracting Officer or his/her designated representative. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away daily or more frequently to maintain safe driving conditions. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored. Upon completion of the work, the Contractor shall ensure that all dirt, trash and debris resulting from construction operations is removed from the work area. Disposal of debris shall be made by the Contractor at his/her expense. All debris shall be delivered to a state-approved sanitary landfill. Notice: The disposal of demolition waste is regulated by the Department of Natural Resources under chapter 260, RSMo. Such waste, in types and quantities

established by the department, shall be taken to a demolition landfill or a sanitary landfill for disposal at the Contractor's expense. Any material that is deposited elsewhere than areas designated as approved by the Contracting Officeror his/her designated representative shall be rehandled and deposited where directed. No payment shall be made to the Contractor for rehandling such material.

#### 1.10 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

- PART 2 PRODUCTS (Not Applicable)
- PART 3 EXECUTION (Not Applicable)
  - -- End of Section --



## SAMPLE CONSTRUCTION SIGN FOR MILCON PROJECTS

## **SCHEDULE**

<b>SPACE</b>	HEI	GHT	LINE	DESCRIPTION	LETTER HEIGH	T STROKE
$\mathbf{A}$	3"	1	U.S.	AIR FORCE PROJECT	1.5"	3/16"
В	1"	2	IN P	ARTNERSHIP WITH	1.5"	3/16"
C	1"	3	U.S.	ARMY CORPS OF ENGINE	EERS 1.5"	3/16"
D	5"	4	PRO	JECT NAME	4"	1/2"
E	3"	5	PRO	JECT NAME CONT'D (IF R	EQUIRED) 4"	1/2"
F	5"	6	GEN	NERAL CONTRACTOR / A-I	E 1.5"	3/16"
G	1"	7	GEN	NERAL CONTRACTOR / A-1	E 1.5"	3/16"

## Colors (Fed. Std. 595a)

Background, Brown, semi-gloss - 20100 (1) Lettering, white, gloss Castle, red AF emblem, colors as required (8" dia.)

(1) Apply 1 coat primer followed by 2 coats brown. Check with BCE to verify 20100 correct color.

## Note:

Use this sign at TAC Bases (ie.) Tyndall, Macdill, Homestead, Eglin, Hurlburt Field, Duke Field and Howard AFB.

# SAFETY PERFORMANCE SIGN

Each contractor's safety record is to be posted on Corps managed or supervised construction projects and mounted with the construction project identification sign.

The graphic format, color, size and typefaces used on the sign are to be reproduced exactly as specified below. The title with First Aid logo in the top section of the sign and the performance record captions are standard for all signs of the type. Legend Groups 2 and 3 below identify the project and the contractor and are to be placed on the sign as shown.

Safety record numbers are mounted on individual metal plates and are screw mounted to the background to allow for daily revisions to posted safety performance record.

**Legend Group 1:** Standard two-line title "Safety is a Job requirement" with (8 od.)

Safety Green First Aid logo. Color: to match PMS 347 Typeface: 3" Helvetica Bold

Color: Black

**Legend Group 2:** One to two-line project title legend describes the work being done under this contract and name of host project.

Color: Black

Typeface: 1.5" Helvetica Regular Maximum line length: 42"

**Legend Group 3:** One to two-line identification; name of prime contractor and city, state address.

Color: Black

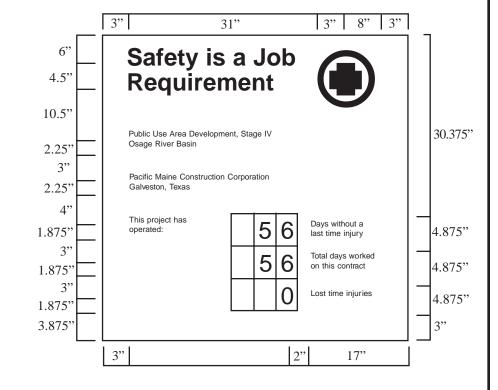
Typeface: 1.5" Helvetica Regular

Maximum line length: 42"

**Legend Group 4:** Standard safety record captions as shown.

Color: Black

Typeface: 12.5" Helvetica Regular



Sign Type	Legend Size		Post Size	Specification Code	Mounting Height	
CID-02	Various	4' X 4'	4" X 4"	HDO-3	48"	WH/BK - GR

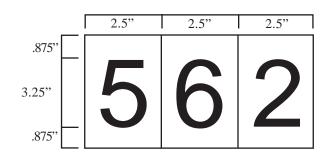
Replaceable numbers are to be mounted on white .060 aluminum plates and screw-mounted to background.

Color: Black

Typeface: 3" Helvetica Regular

Plate size: 2.5" X 5"

All typography is flush left and rag right. Upper and lower case with initial capitals only as shown. Letter - and word - spacing to follow Corps standards.



## SECTION 01525

# SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS 11/02

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z359.1	(1999) Safety Requirements for Personal
	Fall Arrest Systems, Subsystems and
	Components

## ASME INTERNATIONAL (ASME)

ASME B30.5	(2000) Mobile and Locomotive Cranes
ASME B30.8	(2000) Floating Cranes and Floating Derricks
ASME B30.22	(2000) Articulating Boom Cranes
OCCUPATIONAL SAFETY AND	HEALTH ADMINISTRATION (OSHA)
29 CFR 1910	Safety and Health Regulation in General Industry
29 CFR 1910.94	Ventilation
29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.65	Hazardous Waste Operations and Emergency Response
29 CFR 1926.500	Fall Protection

## U. S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (1996) Safety and Health Requirements Manual

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10 (1998) Portable Fire Extinguishers

NFPA 70 (2002) National Electrical Code

NFPA 241 (2000) Safeguarding Construction,
Alteration, and Demolition Operations

#### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

Activity Hazard Analysis (AHA); G

Crane Critical Lift Plan; G

#### SD-06 Test Reports

#### Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

Accident Reports

Monthly Exposure Reports

Regulatory Citations and Violations

Crane Reports

Certificate of Compliance (Crane)

## SD-07 Certificates

Confined Space Entry Permit

Submit one copy of each permit attached to each Daily Quality Control Report.

#### 1.3 DEFINITIONS

- a. Associate Safety Professional (ASP). An individual who is currently certified by the Board of Certified Safety Professionals.
- b. Certified Construction Health & Safety Technician (CHST). An individual who is currently certified by the Board of Certified Safety Professionals.

- c. Certified Industrial Hygienist (CIH). An individual who is currently certified by the American Board of Industrial Hygiene.
- d. Certified Safety Professional (CSP). An individual who is currently certified by the Board of Certified Safety Professionals.
- e. Certified Safety Trained Supervisor (STS). An individual who is currently certified by the Board of Certified Safety Professionals.
- f. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.
- g. Low-slope roof. A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).
- h. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.
- i. Multi-Employer Work Site (MEWS). A multi-employer work site, as defined by OSHA, is one in which many employers occupy the same site. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors.
- j. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).
- k. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:
  - (1) Death, regardless of the time between the injury and death, or the length of the illness;
  - (2) Days away from work;
  - (3) Restricted work;
  - (4) Transfer to another job;
  - (5) Medical treatment beyond first aid;
  - (6) Loss of consciousness; or
  - (7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.
- 1. Site Safety and Health Officer (SSHO). The superintendent or other qualified or competent person who is responsible for the on-site safety and health required for the project. The Contractor quality control (QC) person cannot be the SSHO, even though the QC has safety inspection responsibilities as part of the QC duties.
- ${\tt m.}$  Steep roof. A roof having a slope greater than 4 in 12 (vertical to horizontal).

- n. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.
- o. Weight Handling Equipment (WHE) Accident. A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and collision, including unplanned contact between the load, crane, and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).

## 1.4 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, work performed shall comply with USACE EM 385-1-1, and federal, state, and local, laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

#### 1.5 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Document that no employee uses illegal drugs or consumes alcohol during work hours. Document there are no employees under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine, or saliva specimens and test the injured and involved employees for the influence of drugs and alcohol. A copy of the test shall be made available to the Contracting Officer upon request.

# 1.6 SITE QUALIFICATIONS, DUTIES AND MEETINGS

## 1.6.1 Personnel Qualifications

# 1.6.1.1 Site Safety and Health Officer (SSHO)

Site Safety and Health Officer (SSHO) shall be provided at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The SSHO shall meet the following requirements:

#### Level 4:

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.

30-hour OSHA construction safety class or equivalent within the last 5 years.

An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation;

Scaffolding; Fall protection; Hazardous energy; Confined space; Personal protective equipment and clothing to include selection, use and maintenance; .

- 1.6.1.2 Certified Safety Professional (CSP)
  Provide a Certified Safety Professional (CSP) at the work site to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The CSP shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The CSP will develop, implement, and oversee the Accident Prevention Plan (APP). The CSP will analyze the Activity Hazard Analysis (AHA) to be reviewed by competent field personnel. Activity Hazard Analysis shall include the excavation, stockpiling, and beneficial re-use of chlordane treated soil found around old existing barracks and family housing units.
- 1.6.1.2 Competent Person for Confined Space Entry

Provide a competent person meeting the requirements of EM 385-1-1 who is assigned in writing by the Designated Authority to assess confined spaces and who possesses demonstrated knowledge, skill and ability to:

- a. Identify the structure, location, and designation of confined and permit-required confined spaces where work is done;
- b. Calibrate and use testing equipment including but not limited to, oxygen indicators, combustible gas indicators, carbon monoxide indicators, and carbon dioxide indicators, and to interpret accurately the test results of that equipment;
- c. Perform all required tests and inspections specified in 29 CFR 1910.146 and 29 CFR 1915 Subpart B;
- d. Assess hazardous conditions including atmospheric hazards in confined space and adjacent spaces and specify the necessary protection and precautions to be taken;
- e. Determine ventilation requirements for confined space entries and operations;
- f. Assess hazards associated with hot work in confined and adjacent space and determine fire watch requirements; and,
- g. Maintain records required.
- h. If confined spaces are entered, the Contractor shall identify emergency response personnel who are trained to rescue a victim from a confined space.
- 1.6.1.5 Competent Person for the Health Hazard Control and Respiratory Protection Program

Provide a competent person meeting the requirements of EM 385-1-1 who is:

- a. Capable by education, specialized training and/or experience of anticipating, recognizing, and evaluating employee exposure to hazardous chemical, physical and biological agents in accordance with USACE EM 385-1-1, Section 6.
- b. Capable of specifying necessary controls and protective actions to ensure worker health.

## 1.6.1.3 Crane Operators

Crane operators shall meet the requirements in USACE EM 385-1-1, Appendix G.

#### 1.6.2 Personnel Duties

- 1.6.2.1 Site Safety and Health Officer (SSHO)/Superintendent
  - a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Safety inspection logs shall be attached to the Contractors' daily quality control report.
  - b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.
  - c. Maintain applicable safety reference material on the job site.
  - d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.
  - Implement and enforce accepted APPS and AHAs.
  - Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.
  - Documents sub-contractor compliance with safety and health requirements.

Failure to perform the above duties will result in dismissal of the superintendent and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

- Certified Safety Professional (CSP) 1.6.2.2
  - a. Perform safety and occupational health management, surveillance, inspections, and safety enforcement for the project.
  - Perform as the safety and occupational health "competent person" as defined by USACE EM 385-1-1.
  - Be on site at least monthlywhenever new work, new phase of work, and/ or testing is being performed.

When inspections yield deficiencies, an after action report will be filed and the corrections listed and follow-up procedures listed to the satisfaction of the government.

- Conduct and document safety inspections.
- Shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

If the CSP is appointed as the SSHO all duties of that position shall also be preformed.

## 1.6.3 Meetings

#### 1.6.3.1 Preconstruction Conference

- a. The Contractor will be informed, in writing, of the date of the preconstruction conference. The purpose of the preconstruction conference is for the Contractor and the Contracting Officer's representatives to become acquainted and explain the functions and operating procedures of their respective organizations and to reach mutual understanding relative to the administration of the overall project's APP before the initiation of work.
- b. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the AHAs and special plans, program and procedures associated with it).
- c. The Contractor shall discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated activity hazard analyses (AHAs) that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of AHAs shall be established to preclude project delays.
- d. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Work shall not begin until there is an accepted APP.

# 1.6.3.2 Weekly Safety Meetings

Conduct weekly safety meetings at the project site for all employees. The Contracting Officer will be informed of the meeting in advance and be allowed attendance. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily quality control report.

## 1.6.3.3 Work Phase Meetings

The appropriate AHA shall be reviewed and attendance documented by the Contractor at the preparatory, initial, and follow-up phases of quality control inspection. The analysis should be used during daily inspections to ensure the implementation and effectiveness of safety and health controls.

### 1.7 TRAINING

## 1.7.1 New Employee Indoctrination

New employees (prime and sub-contractor) will be informed of specific site hazards before they begin work. Documentation of this orientation shall be kept on file at the project site.

## 1.7.2 Periodic Training

Provide Safety and Health Training in accordance with USACE EM 385-1-1 and the accepted APP. Ensure all required training has been accomplished for

all onsite employees.

# 1.7.3 Training on Activity Hazard Analysis (AHA)

Prior to beginning a new phase, training will be provided to all affected employees to include a review of the AHA to be implemented.

## 1.8 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Preparation of Accident Prevention Plan". a paragraph or subparagraph element is not applicable to the work to be performed indicate "Not Applicable" next to the heading. Specific requirements for some of the APP elements are described below at paragraph 1.8.1. The APP shall be job-specific and shall address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

Submit the APP to the Contracting Officer 30 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. The Contracting Officer reviews and comments on the Contractor's submitted APP and accepts it when it meets the requirements of the contract provisions.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any unforeseen hazard become evident during the performance of work, the project superintendent shall inform the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment.

In additon, the Contractor shall assess the need for automatic external defibrillators (AEDs) depending on the base EMS response time or ability to respond to a sudden cardiac arrest onsite.

Copies of the accepted plan will be maintained at the resident engineer's office and at the job site.

The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

#### 1.8.1 EM 385-1-1 Contents

In addition to the requirements outlines in Appendix A of USACE EM 385-1-1, the following is required:

- a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSs, CHSTs. The duties of each position shall be specified.
- b. Qualifications of competent and of qualified persons. As a minimum, competent persons shall be designated and qualifications submitted for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal protective equipment and clothing to include selection, use and maintenance.
- c. Confined Space Entry Plan. Develop a confined space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)
- d. Health Hazard Control Program. The Contractor shall designate a competent and qualified person to establish and oversee a Health Hazard Control Program in accordance with USACE EM 385-1-1, Section 6. The program shall ensure that employees, on-site Government representatives, and others, are not adversely exposed to chemical, physical and biological agents and that necessary controls and protective actions are instituted to ensure health.
- e. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of crane hoist's maximum load limit; lifts involving more than one crane or hoist; lifts of personnel; and technically difficult lifts involving non-routine rigging or operation, sensitive equipment, or unusual safety risks in accordance with USACE EM 385-1-1, paragraph 16.c.18. and submit 15 calendar days prior to on-site work.

## f. Alcohol and Drug Abuse Plan

(1) Describe plan for random checks and testing with pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004, "Drug Free Work Force."

- (2) Description of the on-site prevention program
- g. Fall Protection and Prevention (FP&P) Plan. The plan shall be site specific and address all fall hazards in the work place and during different phases of construction. It shall address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 6 feet. A qualified person shall prepare and sign the plan. The plan shall include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, rescue and escape equipment and operations, training requirements, and monitoring methods. Fall Protection and Prevention Plan shall be revised every six months for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. The accepted Fall Protection and Prevention Plan shall be kept and maintained at the job site for the duration of the project. In additon, the Contractor shall make arrangements for emergency response to rescue fall victims at heights.
- h. Lead Abatement Plan. The safety and health aspects of lead-based paint removal, prepared in accordance with Section 13281A, Lead Hazard Control Activities. The Lead Abatement Plan shall be coordiated with the Contractor's APP. The Contractor is responsible for the health and safety of their subcontractors.
- j. Asbestos Hazard Abatement Plan. The safety and health aspects of asbestos work, prepared in accordance with Section 13280A, Asbestos Abatement The Asbestos Hazard Abatement Plan shall be coordinated with the Contractor's Accident Prevention Plan, such that there are no conflicts.

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- $\mbox{m.}$  Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02220A, Demolition
- n. Excavation Plan. The safety and health aspects prepared in accordance with Section 02302N, Backfilling, and Compacting for Utilities.
- o. Training Records and Requirements. List of mandatory training and certifications which are applicable to this project (e.g. explosive actuated tools, confined space entry, fall protection, crane operation, vehicle operator, forklift operators, personal protective equipment); list of requirements for periodic retraining/certification; outline requirements for supervisory and employee safety meetings.

#### 1.9 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1. Submit the AHA for review at least 15calendar days prior to the start of each phase. Format subsequent AHA as amendments to the APP. An AHA will be developed by the Contractor for every operation involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform work. The analysis must identify and evaluate hazards and outline the proposed methods and techniques for the safe completion of each phase of work. At a minimum, define activity being performed, sequence of work, specific safety

and health hazards anticipated, control measures (to include personal protective equipment) to eliminate or reduce each hazard to acceptable levels, equipment to be used, inspection requirements, training requirements for all involved, and the competent person in charge of that phase of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall arrest systems. For work with materials handling equipment, address safeguarding measures related to materials handling equipment. For work requiring excavations, include requirements for safeguarding excavations. An activity requiring an AHA shall not proceed until the AHA has been accepted by the Contracting Officer's representative and a meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activity, including on-site Government representatives. The Contractor shall document meeting attendance at the preparatory, initial, and follow-up phases of quality control inspection. The AHA shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Activity hazard analyses shall be updated as necessary to provide an effective response to changing work conditions and activities. The on-site superintendent, site safety and health officer and competent persons used to develop the AHAs, including updates, shall sign and date the AHAs before they are implemented.

In addtion, the Contractor shall assess the need automatic external defibrillators (AEDs) based on base ems response time. If the need exists, the Contractor will provide the AED and First/Aid CPR trained personnel qualified to operate AEDs.

#### 1.10 DISPLAY OF SAFETY INFORMATION

Within 10 calendar days after commencement of work, erect a safety bulletin board at the job site. The following information shall be displayed on the safety bulletin board in clear view of the on-site construction personnel, maintained current, and protected against the elements and unauthorized removal:

- a. Map denoting the route to the nearest emergency care facility.
- b. Emergency phone numbers.
- c. Copy of the most up-to-date APP.
- d. AHA(s).
- e. OSHA 300A Form.
- f. Results of current safety inspections, deficiencies corrected, after action report; and any air monitoring results, e.g., asbestos, confined spaces, etc.
- g. Confined space entry permit.

- h. Location of emergency equipment, AED, fire extinguishers, etc.
- i. A sign indicating the number of hours worked since last lost workday accident.
- j. OSHA Safety and Health Protection-On-The-Job Poster.
- k. Safety and Health Warning Posters.

## 1.11 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

#### 1.12 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

#### 1.13 REPORTS

#### 1.13.1 Accident Reports

- a. For recordable injuries and illnesses, and property damage accidents resulting in at least \$2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 1 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.
- b. For a weight handling equipment accident the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the WHE Accident Report form and provide the report to the Contracting Officer within 30 calendar days of the accident. The Contracting Officer will provide a blank copy of the accident report form.

## 1.13.2 Accident Notification

Notify the Contracting Officer as soon as practical, but not later than 12, after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$2,000, or any weight handling equipment accident involving a overturned crane, collapsed boom, or any other major damage to the crane or adjacent property. Information shall include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on site and Government investigation is conducted.

## 1.13.3 Monthly Exposure Reports

Monthly exposure reporting to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of

employee-hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

## 1.13.4 Regulatory Citations and Violations

Contact the Contracting Officer immediately of any OSHA or other regulatory agency inspection or visit, and provide the Contracting Officer with a copy of each citation, report, and contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

# 1.13.5 Crane Reports

Submit crane inspection reports required in accordance with USACE EM 385-1-1, Appendix H and as specified herein with Daily Reports of Inspections.

#### 1.14 HOT WORK

Prior to performing "Hot Work" (welding, etc.) or operating other flame-producing devices, a written permit shall be requested from the Whiteman Air Force Base Fire Department. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. The Contractor will provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity.

- a. Oil painting materials (paint, brushes, empty paint cans, etc.), and all flammable liquids shall be removed from the facility at quitting time. All painting materials and flammable liquids shall be stored outside in a suitable metal locker or box and will require re-submittal with non-hazardous materials.
- b. Accumulation of trays, paper, shavings, sawdust, boxes and other packing materials shall be removed from the facility at the close of each workday and such material disposed of in the proper containers located away from the facility.
- c. The storage of combustible supplies shall be a safe distance from structures.
- d. Area outside the facility undergoing work shall be cleaned of trash, paper, or other discarded combustibles at the close of each workday.
- e. All portable electric devices (saws, sanders, compressors, extension chord, lights, etc.) shall be disconnected at the close of each workday. When possible, the main electric switch in the facility shall be deactivated.
- f. When starting work in the facility, Contractors shall require their personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency phone number. ANY FIRE, NO MATTER HOW SMALL, SHALL BE REPORTED TO THE RESPONSIBLE FIRE DEPARTMENT IMMEDIATELY.

#### PART 2 PRODUCTS

## 2.2 CONFINED SPACE SIGNAGE

The Contractor shall provide permanent signs integral to or securely attached to access covers for new permit-required confined spaces. Signs wording: "DANGER--PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER -" in bold letters a minimum of 25 mm(one inch) in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" shall be red and readable from 1.52 m(5 feet).

#### PART 3 EXECUTION

## 3.1 CONSTRUCTION AND/OR OTHER WORK

The Contractor shall comply with USACE EM 385-1-1, NFPA 241, the APP, the AHA, and other related submittals and activity fire and safety regulations.

#### 3.1.1 Hazardous Material Use

Each hazardous material must receive approval prior to being brought onto the job site or prior to any other use in connection with this contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material—Required by Whiteman AFB Bioenvironmental deparment. Any work or storage involving hazardous chemicals or materials must be done in a manner that will not expose Government or Contractor employees to any unsafe or unhealthful conditions. Adequate protective measures must be taken to prevent Government or Contractor employees from being exposed to any hazardous condition that could result from the work or storage. The Prime Contractor shall keep a complete inventory of hazardous materials brought onto the work—site. Approval by the Contracting Officer of protective measures and storage area is required prior to the start of the work.

# 3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.

#### 3.1.3 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos. If additional material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

#### 3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least 15 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the Contracting Officer and the Base Civil (facilities) Engineers to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

#### 3.3 FALL HAZARD PROTECTION AND PREVENTION

The Contractor shall establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. The program shall include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and escape procedures. The Contractor shall be able to rescue a fallen victim at heights or make arrangements to have a subcontractor on standby.

# 3.3.1 Training

The Contractor shall institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, the Contractor shall provide training for each employee who might be exposed to fall hazards. Training requirements shall be in accordance with USACE EM 385-1-1, section 21.A.16.

# 3.3.2 Fall Protection Equipment

The Contractor shall enforce use of the fall protection equipment designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is on a surface 1.8 m(6 feet) or more above lower levels. Fall protection systems such as guardrails, personnel fall arrest system, safety nets, etc., are required when working within 1.8m (6 feet) of any leading edge. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, paragraphs 05.I. and 05.J. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems may be required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. Fall protection must comply with 29 CFR 1926.500, Subpart M and USACE EM 385-1-1.

# 3.3.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ANSI Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest

system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m (6 feet). The total fall distance shall always be taken into consideration when attaching a person to a fall arrest system.

# 3.3.3 Fall Protection for Roofing Work

Fall protection controls shall be implemented based on the type of roof being constructed and work being performed. The roof area to be accessed shall be evaluated for its structural integrity including weight-bearing capabilities for the projected loading.

## a. Low Sloped Roofs:

- (1) For work within 1.8 m (6 feet) of an edge, on low-slope roofs, personnel shall be protected from falling by use of personal fall arrest systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized.
- (2) For work greater than 1.8 m (6 feet) from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.500 and USACE EM 385-1-1.
- b. Steep Roofs: Work on steep roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

# 3.3.4 Safety Nets

If safety nets are used as the selected fall protection system on the project, they shall be provided at unguarded workplaces, over water, machinery, dangerous operations and leading edge work. Safety nets shall be tested immediately after installation with a drop test of 181.4 kg (400 pounds) and every six months thereafter.

## 3.3.5 Existing Anchorage

Existing anchorages, to be used for attachment of personal fall arrest equipment, shall be certified (or re-certified) by a qualified person in accordance with ANSI Z359.1.

## 3.3.6 Horizontal Lifelines

Horizontal lifelines shall be designed, installed, certified and used under the supervision of a qualified person as part of a complete fall arrest system (29 CFR 1926.500).

#### 3.5 SCAFFOLDING

Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access to scaffold platforms greater than 6 m (20 feet) in height shall be accessed by use of a scaffold stair system. Vertical ladders commonly provided by scaffold system

manufacturers shall not be used for accessing scaffold platforms greater than 6 m (20 feet) in height. The use of an adequate gate is required. Contractor shall ensure that employees are qualified to perform scaffold erection and dismantling. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. Special care shall be given to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material is prohibited. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Work platforms shall be placed on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

# 3.6 EQUIPMENT

## 3.6.1 Material Handling Equipment

- a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.
- b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.
- c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

# 3.6.2 Weight Handling Equipment

- a. Cranes must be equipped with:
  - (1) Load indicating devices (LIDs) and a boom angle or radius indicator,
  - (2) or load moment indicating devices (LMIs).
  - (3) Anti-two block prevention devices.
  - (4) Boom hoist hydraulic relief valve, disconnect, or shutoff (stops hoist when boom reaches a predetermined high angle).
  - (5) Boom length indicator (for telescoping booms).
  - (6) Device to prevent uncontrolled lowering of a telescoping hydraulic boom.
  - (7) Device to prevent uncontrolled retraction of a telescoping hydraulic boom.
- b. The Contractor shall notify the Contracting Officer 15 days in advance of any cranes entering the activity so that necessary quality assurance spot checks can be coordinated. Contractor's operator shall

remain with the crane during the spot check.

- c. The Contractor shall comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Erection shall be performed under the supervision of a designated person (as defined in ASME B30.5). All testing shall be performed in accordance with the manufacturer's recommended procedures.
- d. The Contractor shall comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes and ASME B30.8 for floating cranes and floating derricks.
- e. The presence of Government personnel does not relieve the Contractor of an obligation to comply with all applicable safety regulations. The Government will investigate all complaints of unsafe or unhealthful working conditions received in writing from contractor employees, federal civilian employees, or military personnel.
- f. Each load shall be rigged/attached independently to the hook/master-link in such a fashion that the load cannot slide or otherwise become detached. Christmas-tree lifting (multiple rigged materials) is not allowed.
- g. Under no circumstance shall a Contractor make a lift at or above 90% of the cranes rated capacity in any configuration.
- h. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and shall follow the requirements of USACE EM 385-1-1 section 11 and ASME B30.5 or ASME B30.22 as applicable.
- i. Crane suspended personnel work platforms (baskets) shall not be used unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Personnel shall not be lifted with a line hoist or friction crane.
- j. A fire extinguisher having a minimum rating of 10BC and a minimum nominal capacity of 5lb of extinguishing agent shall be available at all operator stations or crane cabs. Portable fire extinguishers shall be inspected, maintained, and recharged as specified in NFPA 10, Standard for Portable Fire Extinguishers.
- k. All employees shall be kept clear of loads about to be lifted and of suspended loads.
- 1. A weight handling equipment operator shall not leave his position at the controls while a load is suspended.
- m. Only Contractor crane operators who have met the requirements of 29 CFR 1910.94, 29 CFR 1910.120, 29 CFR 1926.65, 29 CFR 1926.500, USACE EM 385-1-1, ASME B30.5, and ASME B30.22 and other local and state requirements shall be authorized to operate the crane.
- $\ensuremath{\text{n.}}$  The Contractor shall use cribbing when performing lifts on outriggers.
- o. The crane hook/block must be positioned directly over the load.

Side loading of the crane is prohibited.

- p. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.
- q. A substantial and durable rating chart containing legible letters and figures shall be provided with each crane and securely mounted onto the crane cab in a location allowing easy reading by the operator while seated in the control station.
- r. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by Contracting Officer personnel.
- s. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by Contracting Officer personnel.
- t. The Contractor shall certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

#### 3.6.3 Equipment and Mechanized Equipment

- a. Equipment shall be operated by designated qualified operators. Proof of qualifications shall be kept on the project site for review.
- b. Manufacture specifications or owner's manual for the equipment shall be on site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Such additional safety precautions or requirements shall be incorporated into the AHAs.
- c. Equipment and mechanized equipment shall be inspected in accordance with manufacturer's recommendations for safe operation by a competent person prior to being placed into use.
- d. Daily checks or tests shall be conducted and documented on equipment and mechanized equipment by designated competent persons.

#### 3.7 EXCAVATIONS

The competent person for excavations performed as a result of contract work shall be on-site when excavation work is being performed, and shall inspect, and document the excavations daily prior to entry by workers. The competent person must evaluate all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly.

## 3.7.1 Utility Locations

Prior to digging, the appropriate digging permit must be obtained. All underground utilities in the work area must be positively identified by a private utility locating service in addition to any station locating service and coordinated with the station utility department. Any markings made during the utility investigation must be maintained throughout the contract. Keep a copy of any utility markup tickets, and as a QC step, compare flags and/or markings on the ground to the ticket. The SSHO shall

sign off that this has been done and the permit complied with.

## 3.7.2 Utility Location Verification

The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within .061 m (2 feet) of a known utility must not be performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility the utility shall be exposed by hand digging every 30.5 m (100 feet) if parallel within 1.5 m (5 feet) of the excavation.

## 3.7.3 Utilities with Concrete Slabs

Utilities located within concrete slabs or pier decks, bridges, and the like are extremely difficult to identify. The location must be coordinated with station utility departments in addition to a private locating service. Outages on system utilities shall be used in circumstances where concrete chipping, saw cutting, or core drilling is required and utilities are unable to be completely identified.

## 3.7.4 Shoring Systems

Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on site for review. Job-made shoring or shielding shall have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

# 3.7.5 Trenching Machinery

Trenching machines with digging chain drives shall be operated only when the spotters/laborers are in plain view of the operator. Operator and spotters/laborers shall be provided training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Documentation of the training shall be kept on file at the project site.

## 3.8 ELECTRICAL

# 3.8.1 Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the Contracting Officer and Station Utilities for identification. The Contracting Officer will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in

energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. Insulating blankets, hearing protection, and switching suits may be required, depending on the specific job and as delineated in the Contractor's AHA.

## 3.8.2 Portable Extension Cords

Portable extension cords shall be sized in accordance with manufacturer ratings for the tool to be powered and protected from damage. All damaged extension cords shall be immediately removed from service. Portable extension cords shall meet the requirements of NFPA 70.

#### 3.9 WORK IN CONFINED SPACES

The Contractor shall comply with the requirements in Section 06.I of USACE EM 385-1-1 and OSHA 29 CFR 1910.146. Any potential for a hazard in the confined space requires a permit system to be used.

- a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of USACE EM 385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.
- b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.
- c. Ensure the use of rescue and retrieval devices in confined spaces greater than 1.5 m (5 feet) in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of USACE EM 385-1-1.
- d. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.
- e. Include training information for employees who will be involved as entrants and attendants for the work. Conform to Section 06.I.06 of USACE EM 385-1-1.
- f. Daily Entry Permit. Post the permit in a conspicuous place close to the confined space entrance.
- g. The Contractor shall document that there are emergency reponse plans and personnel ready to rescue a confined space victim. If necessary, the services of subcontractor trained in confined space rescue shall be arranged for.

#### 3.10 CRYSTALLINE SILICA

Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA

regulations, such as 29 CFR 1910.94, and USACE EM 385-1-1, Appendix C. The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

#### 3.11 HOUSEKEEPING

## 3.11.1 Clean-Up

All debris in work areas shall be cleaned up daily or more frequently if necessary. Construction debris may be temporarily located in an approved location, however garbage accumulation must be removed each day.

#### 3.11.2 Dust control

In addition to the dust control measures required elsewhere in the contract documents, dry cutting of brick or masonry shall be prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to this prohibition on a case-by-case basis. Wet cutting must address control of water run off.

-- End of Section --

#### SECTION 01780A

# CLOSEOUT SUBMITTALS 11/99

#### PART 1 GENERAL

#### 1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted for each Task Order in accordance with Section 01330 SUBMITTAL PROCEDURES which will be provided on a Task Order basis.

## SD-02 Shop Drawings

As-Built Drawings; G-RE.

Drawings showing final as-built conditions of the project. The final CADD as-built drawings shall consist of one set of electronic CADD drawing files in the specified format, one set of mylar drawings, 2 sets of blue-line prints of the mylars, and one set of the approved working as-built drawings.

### SD-03 Product Data

As-Built Record of Equipment and Materials; G-RE.

Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

Warranty Management Plan; G-RE.

One set of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

Warranty Tags; G-RE.

Two record copies of the warranty tags showing the layout and design.

Final Cleaning; G-RE.

Two copies of the listing of completed final clean-up items.

# 1.2 PROJECT RECORD DOCUMENTS

## 1.2.1 As-Built Drawings

This paragraph covers as-built drawings complete, as a requirement of the

contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

## 1.2.1.1 Government Furnished Materials

One set of electronic CADD files in the specified software and format revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring CADD file as-built drawings.

## 1.2.1.2 Working As-Built and Final As-Built Drawings

The Contractor shall revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and at least one set shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. Final as-built drawings shall be prepared after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (Foundations, Utilities, Structural Steel, etc., as appropriate for the project). The working as-built marked prints and final as-built drawings will be jointly reviewed for accuracy and completeness by the Contracting Officer and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of updated drawings. The working and final as-built drawings shall show, but shall not be limited to, the following information:

- a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.
- b. The location and dimensions of any changes within the building structure.
- c. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.
- d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
- e. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

- f. Changes or modifications which result from the final inspection.
- g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.
- h. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, the Contractor shall furnish a contour map of the final borrow pit/spoil area elevations.
- i. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.
- j. Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.
  - (1) Directions in the modification for posting descriptive changes shall be followed.
  - (2) A Modification Circle shall be placed at the location of each deletion.
  - (3) For new details or sections which are added to a drawing, a Modification Circle shall be placed by the detail or section title.
  - (4) For minor changes, a Modification Circle shall be placed by the area changed on the drawing (each location).
  - (5) For major changes to a drawing, a Modification Circle shall be placed by the title of the affected plan, section, or detail at each location.
  - (6) For changes to schedules or drawings, a Modification Circle shall be placed either by the schedule heading or by the change in the schedule.
  - (7) The Modification Circle size shall be 12.7 mm diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.

#### 1.2.1.3 Drawing Preparation

The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Contracting Officer after approval by the Government. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.

1.2.1.4 Computer Aided Design and Drafting (CADD) Drawings

Only personnel proficient in the preparation of CADD drawings shall be employed to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings shall be

equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols shall be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, they shall be prepared using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final as-built drawings shall be identical to that used on the contract drawings. Additions and corrections to the contract drawings shall be accomplished using CADD files. The Contractor will be furnished Microstation 95 software and a Windows NT operating system. The electronic files will be supplied on compact disc, read-only memory (CD-ROM). The Contractor shall be responsible for providing all program files and hardware necessary to prepare final as-built drawings. The Contracting Officer will review final as-built drawings for accuracy and the Contractor shall make required corrections, changes, additions, and deletions.

- a. CADD colors shall be the "base" colors of red, green, and blue. Color code for changes shall be as follows:
  - (1) Deletions (red) Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.
  - (2) Additions (Green) Added items shall be drawn in green with green lettering in notes and leaders.
  - (3) Special (Blue) Items requiring special information, coordination, or special detailing or detailing notes shall be in blue.
- b. The Contract Drawing files shall be renamed in a manner related to the contract number (i.e., 98-C-10.DGN) as instructed in the Pre-Construction conference. Marked-up changes shall be made only to those renamed files. All changes shall be made on the layer/level as the original item. There shall be no deletions of existing lines; existing lines shall be over struck in red. Additions shall be in green with line weights the same as the drawing. Special notes shall be in blue on layer #63.
- c. When final revisions have been completed, the cover sheet drawing shall show the wording "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 5 mm high. All other contract drawings shall be marked either "AS-Built" drawing denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions. Original contract drawings shall be dated in the revision block.
- d. Within 20 days after Government approval of all of the working as-built drawings for a phase of work, the Contractor shall prepare the final CADD as-built drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Government review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days the Contractor shall revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 20 days of substantial completion of all phases of work, the Contractor shall submit the final as-built drawing package for the entire project. The submittal shall consist of one set of electronic files on compact disc, read-only memory (CD-ROM), one set of mylars, two sets of blue-line prints and one set of the approved working as-built drawings. They shall be complete in

all details and identical in form and function to the contract drawing files supplied by the Government. Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and marked prints as specified shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

# 1.2.1.5 Manually Prepared Drawings

Only personnel proficient in the preparation of manually prepared drawings shall be employed to modify the original contract drawing or prepare additional new drawings. Additions and corrections to the contract drawings shall be neat, clean and legible, shall be done to the same level of detail, and shall match the adjacent existing line work, and lettering being annotated in type, density, size and style. Drafting work shall be done using the same medium (pencil, plastic lead or ink) that was employed on the original contract drawings and with graphite lead on paper base material. The Contracting Officer will review as-built drawings for accuracy and conformance to the above specified drafting standards. Corrections, changes, additions, and deletions required shall meet these standards. The title block to be used for any new as-built drawings shall be similar to that used on the original drawings.

- a. When final revisions have been completed, each drawing shall be lettered or stamped with the words "RECORD DRAWING AS-BUILT" followed by the name of the Contractor in letters at least 5 mm high. Original contract drawings shall be marked either "As-Built" drawings denoting no revisions on the sheet or "Revised As-Built" denoting one or more revisions All original contract drawings shall be dated in the revision block.
- b. Within 20 days after Government approval of all of the working as-built drawings for a phase of work, the Contractor shall prepare the final as-built drawings for that phase of work and submit two sets of blue-line prints of these drawings for Government review and approval. Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days the Contractor shall revise the drawings accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 20 days of substantial completion of all phases of work, the Contractor shall submit the final as-built drawing package for the entire project. The submittal shall consist of the completed final as-built drawings, two blue-line prints of these drawings and the return of the approved marked as-built prints. The drawings shall be complete in all details. Paper prints and reproducible drawings will become the property of the Government upon final approval. Failure to submit final as-built drawings and marked prints, as required herein, will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

## 1.2.1.6 Payment

No separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be

considered a subsidiary obligation of the Contractor.

# 1.2.2 As-Built Record of Equipment and Materials

The Contractor shall furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Two sets of final record of equipment and materials shall be submitted 10 days after final inspection. The designations shall be keyed to the related area depicted on the contract drawings. The record shall list the following data:

## RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

Description	Specification	Manufacturer	Composition	Where
	Section	and Catalog,	and Size	Used
		Model, and		
		Serial Number		

## 1.2.3 Final Approved Shop Drawings

The Contractor shall furnish final approved project shop drawings 30 days after transfer of the completed facility.

# 1.2.4 Construction Contract Specifications

The Contractor shall furnish final as-built construction contract specifications, including modifications thereto, 30 days after transfer of the completed facility.

# 1.2.5 Real Property Equipment

The Contractor shall furnish a list of installed equipment furnished under this contract. The list shall include all information usually listed on manufacturer's name plate. The "EQUIPMENT-IN-PLACE LIST" shall include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. A draft list shall be furnished at time of transfer. The final list shall be furnished 30 days after transfer of the completed facility.

#### 1.3 WARRANTY MANAGEMENT

## 1.3.1 Warranty Management Plan

The Contractor shall develop a warranty management plan which shall contain information relevant to the clause Warranty of Construction in Section 00800. At least 30 days before the planned pre-warranty conference, the Contractor shall submit the warranty management plan for Government approval. The warranty management plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction

phase shall be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Information contained in the warranty management plan shall include, but shall not be limited to, the following:

- a. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.
- b. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.
- c. A list for each warranted equipment, item, feature of construction or system indicating:
  - 1. Name of item.
  - 2. Model and serial numbers.
  - 3. Location where installed.
  - 4. Name and phone numbers of manufacturers or suppliers.
  - 5. Names, addresses and telephone numbers of sources of spare parts.
  - 6. Warranties and terms of warranty. This shall include one-year overall warranty of construction. Items which have extended warranties shall be indicated with separate warranty expiration dates.
  - 7. Cross-reference to warranty certificates as applicable.
  - 8. Starting point and duration of warranty period.
  - 9. Summary of maintenance procedures required to continue the warranty in force.
  - $10.\ \mbox{Cross-reference}$  to specific pertinent Operation and Maintenance manuals.
  - 11. Organization, names and phone numbers of persons to call for warranty service.
  - 12. Typical response time and repair time expected for various warranted equipment.
- d. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.
- e. Procedure and status of tagging of all equipment covered by extended warranties.
- f. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

#### 1.3.2 Performance Bond

The Contractor's Performance Bond shall remain effective throughout the construction period.

a. In the event the Contractor fails to commence and diligently

pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

- b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.
- c. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

#### 1.3.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor shall furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, shall be continuously available, and shall be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

# 1.3.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframes specified, the Government will perform the work and backcharge the construction warranty payment item established.

- a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.
- b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
  - c. Third Priority Code 3. All other work to be initiated within 3

work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows:

## Code 1-Air Conditioning Systems

- (1) Recreational support.
- (2) Air conditioning leak in part of building, if causing damage.
- (3) Air conditioning system not cooling properly.

#### Code 1-Doors

- (1) Overhead doors not operational, causing a security, fire, or safety problem.
- (2) Interior, exterior personnel doors or hardware, not functioning properly, causing a security, fire, or safety problem.

## Code 3-Doors

- (1) Overhead doors not operational.
- (2) Interior/exterior personnel doors or hardware not functioning properly.

#### Code 1-Electrical

- (1) Power failure (entire area or any building operational after 1600 hours).
- (2) Security lights
- (3) Smoke detectors

#### Code 2-Electrical

- (1) Power failure (no power to a room or part of building).
- (2) Receptacle and lights (in a room or part of building).

#### Code 3-Electrical

Street lights.

#### Code 1-Gas

- (1) Leaks and breaks.
- (2) No gas to family housing unit or cantonment area.

#### Code 1-Heat

- (1). Area power failure affecting heat.
- (2). Heater in unit not working.

# Code 2-Kitchen Equipment

- (1) Dishwasher not operating properly.
- (2) All other equipment hampering preparation of a meal.

### Code 1-Plumbing

- (1) Hot water heater failure.
- (2) Leaking water supply pipes.

#### Code 2-Plumbing

- (1) Flush valves not operating properly.
- (2) Fixture drain, supply line to commode, or any water pipe leaking.
- (3) Commode leaking at base.

# Code 3 -Plumbing

Leaky faucets.

#### Code 3-Interior

- (1) Floors damaged.
- (2) Paint chipping or peeling.
- (3) Casework.

## Code 1-Roof Leaks

Temporary repairs will be made where major damage to property is occurring.

## Code 2-Roof Leaks

Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 2-Water (Exterior)

No water to facility.

Code 2-Water (Hot)

No hot water in portion of building listed.

Code 3-All other work not listed above.

# 1.3.5 Warranty Tags

At the time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by the Contracting Officer. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and the QC signature shall remain blank until project is accepted for beneficial occupancy. The tag shall show the following information.

a.	Type of product/material
	Model number
	Serial number
d.	Contract number
e.	Warranty periodfromto
f.	Inspector's signature
g.	Construction Contractor
	Address
	Telephone number
h.	Warranty contact
	Address
	Telephone number
i.	Warranty response time priority code

- j. WARNING PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.
- 1.4 MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Prior to final inspection and transfer of the completed facility; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems shall be submitted to and approved by the Contracting Officer as specified in applicable technical specification sections.

#### 1.5 OPERATION AND MAINTENANCE MANUALS

Operation manuals and maintenance manuals shall be submitted as specified. Operation manuals and maintenance manuals provided in a common volume shall be clearly differentiated and shall be separately indexed.

#### 1.6 FINAL CLEANING

The premises shall be left broom clean. Stains, foreign substances, and temporary labels shall be removed from surfaces. Carpet and soft surfaces shall be vacuumed. Equipment and fixtures shall be cleaned to a sanitary condition. Filters of operating equipment shall be replaced. Debris shall be removed from roofs, drainage systems, gutters, and downspouts. Paved areas shall be swept and landscaped areas shall be raked clean. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed. A list of completed clean-up items shall be submitted on the day of final inspection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

# DIVISION 2 - SITE WORK

02220 02230	Demolition Clearing and Grubbing
02300	Earthwork
02315	Excavation, Filling, and Backfilling for Buildings
02316	Excavation, Trenching, and Backfilling for Utilities Systems
02620	Subdrainage System
02700	Asphaltic Concrete Intermediate Leveling and Surface Courses
	(Central Plant Hot Mix)
02712	Lime-Modified Subgrade
02714	Rapid Drainage Layer
02721	Subbase Courses
02722	Graded, Crushed Aggregate Base Course and Rigid Base Course
02748	Bituminous Tack and Prime Coats
02760	Field Molded Sealants for Sealing Joints in Rigid Pavements
02763	Pavement Markings
02770	Concrete Sidewalks, Curbs and Gutters, and Exterior Slabs

#### SECTION 02220

# DEMOLITION 12/97

#### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

#### ENGINEERING MANUALS (EM)

EM 385-1-1

(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

## 1.2 GENERAL REQUIREMENTS

The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be disposed of as specified.

# 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Work Plan; .

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

# 1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent

the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

#### 1.5 PROTECTION

#### 1.5.1 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

## 1.5.3 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. The portions of the existing apron which are to be demolished shall be done at the joints. Any damage to the pavement which is to remain shall be repaired at no expense to the government.

#### 1.5.6 Environmental Protection

The work shall comply with the requirements of Section 01410 ENVIRONMENT PROTECTION .

# 1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted .

# 1.7 USE OF EXPLOSIVES

Use of explosives will not be permitted.

### PART 2 PRODUCTS (Not Applicable)

#### PART 3 EXECUTION

## 3.1 EXISTING STRUCTURES

Pavement, sidewalks, curbs, gutters and street light bases shall be removed as indicated.

# 3.2 UTILITIES

Disconnection of utility services, with related meters and equipment, shall

be coordinated with the Contracting officer. Existing utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

#### 3.3 FILLING

Holes, open basements and other hazardous openings shall be filled in accordance with Section 2516 Excavation and Backfilling for Utilities.

#### 3.4 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished, except Government salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

#### 3.4.1 Salvageable Items and Material

Contractor shall salvage items and material to the maximum extent possible.

#### 3.4.1.1 Material Salvaged for the Contractor

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

## 3.4.1.2 Items Salvaged for the Government

Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents.

# 3.4.1.4 Historical Items

Historical items shall be removed in a manner to prevent damage. The following historical items shall be delivered to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.

# 3.4.2 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in the disposal area located off base. Combustible material shall be disposed of off the site.

#### 3.5 CLEAN UP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

# 3.6 PAVEMENTS

Existing pavements designated for removal shall be full depthsaw cut and

removed in accordance with the details shown on the drawings and to the limits and depths indicated on the drawings .

-- End of Section --

### SECTION 02230

# CLEARING AND GRUBBING 06/97

### PART 1 GENERAL

### 1.1 DEFINITIONS

### 1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

# 1.1.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 75~mm in diameter, and matted roots from the designated grubbing areas.

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preeconstruction Submittals

Materials Other Than Salable Timber;.

Written permission to dispose of such products on private property shall be filed with the Contracting Officer.

PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION

### 3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

### 3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 455 mm below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas

under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

## 3.4 DISPOSAL OF MATERIALS

### 3.4.1 Salable Timber

There should not be any salable timber associated with this project.

## 3.4.2 Materials Other Than Salable Timber

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed. —— End of Section ——

# SECTION 02300

# EARTHWORK 12/97

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1140	(1992) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 548	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies

# 1.2 DEFINITIONS

# 1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL, ML, or CH. Satisfactory materials for grading shall be comprised of stones less than 75 mm in the

upper 6 inches of fill or larger than 3 inches for the remainder of the fill.

# 1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include; expansive materials; trash; refuse; man-made fills; backfills from previous construction; material classified as satisfactory which contains root and other organic matter or frozen material, fine-grained sedimentary rock (i.e. shale, clay stone, silt stone, mud stone, and marl) even though they may be intensely weathered, contamination from hazardous and toxic substances, or other material determined by the contracting officer as unsatisfactory for providing a stable subgrade or structural foundation. Otherwise suitable material which contains excess moisture will not be classified as unsuitable material unless it cannot be dried by manipulation, aeration, or blending with other materials (i.e., dry soil, etc.) as approved by the Contracting Officer. The Contracting Officer shall be notified of any contaminated materials.

### 1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

### 1.2.4 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

### 1.2.5 Subgrade Reinforcement Material

Subgrade reinforcement material includes sound, tough, durable crushed stone, slag or gravel, consisting of pieces varying from 25 mm to 89 mm in diameter, or other approved material, with necessary filler. When a finer material is necessary for filler, broken stone chips, screened gravel, or sand may be used to completely fill all voids.

# 1.2.6 Expansive and Non-expansive Soils

Expansive soils are defined as soils having a plasticity index equal to or greater than 12 when tested in accordance with ASTM D 4318. Non-expansive soils is defined as a soils with plasticity index less tan or equal to 12 in accordance with ASTM D 4318.

# 1.2.7 Acceptable Topsoil

Acceptable topsoil includes selectively excavated topsoil material that is representative of local soils that produce heavy growths of crops, grass, or other vegetation, and is reasonably free from underlying subsoil, clay lumps, weeds, litter, brush, matted roots, toxic substances, or any material harmful to plant growth or which would hinder grading, planting, or maintenance operations. Topsoil shall not contain more than 5 percent

by volume or stones or other such objects larger than one inch in any dimension for field-seeded areas and on-half inch in any dimension for lawn seeded areas.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittal

Earthwork; G-RE.

Procedure and location for disposal of unused satisfactory material and proposed source of borrow material.

SD-06 Test Reports

On-Site Materials; G-KC.

The following shall be submitted for each type of on-site material: compaction curve (ASTM D 1557); Liquid Limit and Plastic Limit (ASTM D 4318); In situ Moisture Content (ASTM D 2216); Particle-Size Analysis (ASTM D 422); and Soil Classification (ASTM D 2487).

Borrow Materials; G-KC.

The following shall be submitted for each type of borrow material intended for use at the proposed site: compaction curve (ASTM D 1557); Liquid Limit and Plastic Limit (ASTM D 4318); In situ Moisture Content (ASTM D 2216); Particle-Size Analysis (ASTM D 422); and Soil Classification (ASTM D 2487).

SD-07 Certificates

Testing; G-RE.

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

### 1.4 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings. This data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

### 1.5 CLASSIFICATION OF EXCAVATION

For estimating purposes, no consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

# 1.6 BLASTING

Blasting will not be permitted.

### 1.7 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of off Government controlled land. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

# PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION

### 3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 300 millimeters. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 50 mm in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site.

# 3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

## 3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory,

thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 1 meter from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

## 3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

### 3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. satisfactory materials are not available in sufficient quantity for required excavations, satisfactory materials meeting the criteria for its specified use shall be obtained from a source(s) outside the limits of Government-controlled land at the Contractor's expense. Borrow shall be produced from an accepted source(s) and approved at the job site. Acceptance of a source (s) proposed by the Contractor will be based on the results of site investigation(s) and laboratory testing performed as described in paragraph, "Investigation of Potential Borrow Sources(s)." The Contracting Officer shall be notified a minimum of three (3) working days prior to investigating a proposed borrow source in order that a representative of the Contracting Office may be present to observe sampling of the borrow area and/or laboratory testing of samples obtained from the proposed source(s). The Contractor shall submit the initial test results for acceptance by the Contracting Officer a minimum of 14 days prior to initiating construction. A certified test report (with supporting test data) shall be submitted for each type of material proposed for use from the proposed borrow source in accordance with the technical provisions herein. The report(s) shall include a site location plan showing the location of the proposed borrow area relative to Whiteman AFB on a county road map; a property map of the site on which the borrow area is located; the location of the borrow area(s) on the property; and the approximate location and elevation of test sample in the borrow area. The proposed source cannot be changed without the approval of the Contracting Officer and the acceptance of another source of borrow by the Contracting Officer. The approval of a site as "acceptable" does not approve all materials encountered on that site, but only those "types" materials approved. Initial acceptance tests to which the proposed borrow material will be subjected are described in paragraph: SUBMITTALS. Final acceptance of borrow materials at the project site shall be based on results of testing specified hereinafter in paragraph: COMPACTION and in paragraph: TESTING. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties.

# 3.4 Investigation of Potential Borrow Sources(s)

The investigation of each potential borrow source shall be accomplished by the Contractor under the direction of a Registered Professional Engineer. Each potential borrow source shall be investigated by a test boring made for each 8370 square meters of surface area of the proposed source. Each boring shall penetrate the entire thickness of overburden to top of rock, which in the Whiteman area is typically a weathered shale, sandstone, or limestone material. Samples shall be obtained of each 1.5 meters of the overburden penetrated. A description of each samples shall include the major and minor constituents, the color, the consistency and plasticity of cohesive materials, the relative density or hardness of cohesionless materials, and the relative moisture content. The Atterberg limits and moisture content shall be reported for each sample obtained. Materials having the same Unified Soils Classification and, for cohesive soils, a PI varying not more than 2 percent (plus or minus) will be considered of a similar "type". Testing shall be performed on each "type" of soil for compliance with paragraph: SUBMITTALS, and shall be used as the control for similar "type" material for production testing. The report shall indicate, in a general manner, the borings, the elevation, and thickness of each "type" of materials applicable to each moisture/density curve.

## 3.5 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

# 3.6 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

### 3.7 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted as specified in Section: EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and Section: STORM-DRAINAGE SYSTEM; and Section: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

# 3.8 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

### 3.8.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 150 mm; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to the specified density. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

### 3.8.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and recompacted to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

### 3.9 EMBANKMENTS

# 3.9.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 75 mm. The material shall be placed in successive horizontal layers of loose material not more than 200 millimeters in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted as specified below. Each layer shall be compacted before the overlaying lift is placed. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Each layer shall be compacted to not less than the percent of laboratory maximum density as specified below:

95

# Percent Laboratory maximum density

percent nor more than 93 percent

90

Cohesive material material material

Fill, embankment, subgrade and backfill

Under structures, building slabs, steps, paved areas, around footings, and in trenches 90 95

Under sidewalks and grassed areas 85 90

Expansive materials Compacted to not less than 88

# 3.10 SUBGRADE PREPARATION

### 3.10.1 Construction

Select Material

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 150 mm below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways and airfields shall not show deviations greater than 12.7 millimeter when tested with a 3.05 meter straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 15 mm from the established grade and cross section.

# 3.10.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Each layer of the embankment shall be compacted as required in EMBANKMENTS.

# 3.10.2.1 Subgrade for Pavements

Subgrade for flexible pavements shall be compacted to at least 95 percentage laboratory maximum density for the depth below the surface of

the pavement shown. Subgrade for rigid pavements shall be compacted to at least 90 percent laboratory maximum density for the depth below the surface of the pavement shown. When more than one soil classification is present in the subgrade, the top 150 mm of subgrade shall be scarified, windrowed, thoroughly blended, reshaped, and compacted. The moisture content of subgrade material shall be adjusted by wetting or aeration, as required to a range plus or minus 2 percent of optimum moisture content.

# 3.11 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 30 mm of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

## 3.12 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 50 mm depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from off Government property.

## 3.13 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Laboratory or contractor testing approval shall be based on compliance with ASTM E 548. The first inspection will be at the expense of the Government. Cost incurred for any subsequent inspections required because of failure of the first inspection will be charged to the Contractor. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D  $2\overline{167}$ , or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. ASTM D 2937, Drive Cylinder Method shall be used only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the

materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

### 3.13.1 In-Place Densities

- a. One test per 929 square meters, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 320 linear meters, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

## 3.13.2 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked at least twice daily in accordance with ASTM D 1556.

### 3.13.3 Moisture Contents

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D 2216 and checked for compliance with allowable limits relative to the laboratory optimum moisture. Atterberg limits (ASTM D 4318) shall be made by the Contractor in conjunction with each moisture content test in order to establish the material "type" and the corresponding laboratory maximum density. The use of fly ash or other drying agent, approved by the Contracting Officer, to adjust the moisture content of excavated or borrow materials to within acceptable moisture ranges shall be the Contractor's option and shall be made at no additional cost to the Government. The request for approval shall be accompanied with a moisture/density curve developed for the soil in question with the minimum amount of drying agent required to reduce the moisture content from that encountered in situ to the maximum moisture allowed relative to the plastic limit of the modified material. Henceforth, this moisture/density curve with the drying agent incorporated shall be used to determine the maximum laboratory density.

## 3.13.4 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material, including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 250 cubic meters of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

Tests for determination of maximum density and optimum moisture shall be performed by the Contractor in accordance with the requirements of ASTM D 1557 Method B, C, or D, except that a mechanical tamper may be used provided the results are correlated with those obtained with the referenced hand tamper. Samples shall be representative of the materials to be placed. Soils shall be grouped together into "types" such that all members of the "type" have a PI that does not very more than 2 percent plus or minus from the mean PI of the "type". A moisture/density curve shall be made for each "type" material or source of material including borrow materials. Additional moisture/density curve(s) shall be made at the direction of the Contracting Officer, or when any change in material "type"

occurs. Included with each moisture/density curve will be a determination of the in situ moisture content determined in accordance with ASTM D 2216 and the Atterberg limits determined in accordance with ASTM D 4318 for materials with 15 percent or more of the total sample passing the #200 sieve. The gradation of materials having 30 percent or more of the total sample retained on the #200 sieve shall be determined in accordance with ASTM D 422. A copy of these tests shall be submitted to the Contracting Officer for approval prior to placement of any fill.

# 3.14.5 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

### 3.15 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

-- End of Section --

## SECTION 02315

# EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS 08/98

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

# 1.2 DEGREE OF COMPACTION

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, abbreviated as percent laboratory maximum density.

# 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Field Test Control; G-RE

Qualifications of the laboratory who will be performing all testing in accordance with paragraph  ${\tt TESTING}$ 

SD-06 Testing Reports

Testing;

Copies of all laboratory and field test reports within 24 hours of the completion of the test. The following results shall be submitted for both on-site materials and borrow materials; for on-site materials, one test shall be performed on existing fill and one on native overburden:

Compaction Curve, ASTM D 1557 Liquid Limit, ASTM D 4318 Plastic Limit, ASTM D 4318 In situ moisture content, ASTM D 2216 Material Description Particle size analysis, ASTM D422 Soil Classification according to USCS

A particle size analysis shall be performed on Capillary Water Barrier material in accordance with ASM D 422. Certified labv results shall be submitted for approval.

#### PART 2 PRODUCTS

#### 2.1 MATERIALS

# 2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SM, SC, CL, ML, or CH. Lime and fly ash shall also be considered as satisfactory materials when used as stabilizing agents.

# 2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Expansive soils are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Materials classified as MH, Pt, OH, SP, and OL according to ASTM D 2487 are unsatisfactory. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, fine-grained sedimentary rock (i.e shale, clay stone, siltstone, mud stone, and marl) even though they may be intensely weathered; contamination from hazardous and toxic substances, stone having a maximum dimension larger tan 2 inches in the upper 6 inches of fill or larger than 3 inches for the remainder of the

fill and other materials that are determined by the Contracting Officer as unsatisfactory for providing a stable subgrade or structural foundation. Otherwise suitable material which contains excess moisture will not be classified as unsuitable material unless it cannot be dried by manipulation, aeration, or blending with other materials (i.e., dry soil, etc.) as approved by the Contracting Officer. The Contracting Officer shall be notified of any contaminated materials.

### 2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

## 2.1.4 Expansive/Non-expansive Soils

Expansive soils are defined as soils that have a plasticity index equal to or greater than 18 when tested in accordance with ASTM D 4318. Non-expansive soil is defined as a soil with a plasticity index less than or equal to 18 when tested in accordance with ASTM D 4318.

### 2.1.5 Select Material

Select material shall consist of natural sand and gravel, crushed rock, manufactured sand, or quarry fines. The material shall have a maximum particle size of 25.4 mm and a minimum of at least 15 percent passing the 0.075 mm (No. 200 )size sieve, but not more than 49 percent. The portion of material passing the 450 um (No. 40 )size sieve shall either be non-plastic or shall have a plasticity index less than or equal to 12.

## 2.1.6 Acceptable Topsoil

Acceptable topsoil includes selectively excavated topsoil material that is representative of local soils that produce heavy growths of crops, grass, or other vegetation, and is reasonably free from underlying subsoil, clay lumps, weeds, litter, brush, matted roots, toxic substances, or any material harmful to plant growth or which would hinder grading, planting, or maintenance operations. Topsoil shall not contain more than 5 percent by volume or stones or other such objects larger than one inch in any dimension for field-seeded areas and on-half inch in any dimension for lawn seeded areas.

### 2.2 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 37.5 mm and no more than 2 percent by weight shall pass the 4.75 mm size sieve.

## PART 3 EXECUTION

# 3.1 CLEARING AND GRUBBING

The areas within lines 1.5 m outside of each building and structure line shall be cleared and grubbed of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter shall be

completely removed and the resulting depressions shall be filled with satisfactory material, placed and compacted in accordance with paragraph FILLING AND BACKFILLING. Materials removed shall be disposed of as specified in Section 02300 EARTHWORK. Trees identified to be undisturbed shall not be removed.

# 3.2 PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, AND IMPROVEMENTS

Protection of existing vegetation, structures, utilites, and improvements is specified in the CONTRACT CLAUSES. Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained shall be protected from damage during excavation and backfilling, if damaged, shall be repaired by the Contrator at no expense to the government. Any existing utility lines that are to be retained and that are shown on the drawings, or the locations of which are not made known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Contractor, and adjustment in payment will be made. When utility lines that are to be removed are encountered within the area of operations, the Contrator shall notify the Contracting Officer in ample time for the necessary measures to be taken to prevent interruption of service.

### 3.2 TOPSOIL

Topsoil shall be stripped to a depth of 150 millimeters below existing grade within the designated excavations and grading lines and deposited in storage piles for later use. Excess topsoil shall be disposed as specified for excess excavated material.

## 3.3 EXCAVATION

### 3.3.1 General

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified, and shall include trenching for utility and foundation drainage systems to a point1.5 m beyond the building line of each building and structure, excavation for outside grease interceptors, underground fuel tanks, and all work incidental thereof. These excavations shall be made through the select material working platform. Building foundations shall bear either entirely on natural undisturbed subgrade or on a minimum of of approved compacted subgrade. Excavations for footings bearing on natural subgrade shall be excavated to the design elevation with minimum disturbances to the subgrade. Excavations and surfaces supporting concrete shall be clean and thoroughly "crumbed out," being free of clumps of loose earth and unsatisfactory material. The earthen sidewalls of the excavation may be used as forms for the footings. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services and for inspection. Satisfactory material removed from structural excavation shall be stockpiled for reuse as backfill. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material; Payment therefor will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES. Satisfactory material removed below the

depths indicated, without specific direction of the Contracting Officer, shall be replaced, at no additional cost to the Government, with satisfactory materials to the indicated excavation grade; except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations and over-break in rock excavation. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

## 3.3.2 Foundation Protection and Preparation

All foundation soils on which concrete footings are placed shall be protected from movement or other damage due to frost penetration. Soil backfill, insulation, heat, or other approved methods shall be used to protect the foundation system during periods of the year in which frost penetration is possible. Excavation to final grade shall not be made until just before concrete is to be placed. At the discretion of the Contracting Officer, excavation for footings can be discontinued if the Contractor is not backfilling footings and walls or is not protecting the excavation from deterioration in a timely manner. If in the opinion of the Contracting Officer, a surface supporting concrete has been "softened" due to ponding of water, freezing, or premolded due to traffic or improper excavation techniques, the material in question shall be removed. Material removed beneath the bearing elevation of footings shall be replaced with concrete. Backfilling of overdepth excavation directed by the Contracting Officer shall be placed on undisturbed natural material. Material removed beneath slabs-on-grade shall be replaced with select material compacted to the required density.

# 3.3.3 Inspection

After the footing excavations are complete, the bearing surfaces shall be examined by a representative of the Geotechnical Branch, Kansas City District, U.S. Army Corps of Engineers representing the Contracting Officer. The Contractor shall provide at least three working days notice to the resident office of his anticipated need for inspection of footing excavations.

# 3.4 DRAINAGE AND DEWATERING

# 3.4.1 Drainage

Surface water shall be directed away from excavation and construction sites to prevent erosion, softening of the foundation bottom, ponding water in excavations, and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained. Under no conditions will water be allowed to pond in excavations either due to seepage, surface runoff, or other means of discharge of water into excavations.

# 3.4.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of

construction. French drains, sumps, ditches or trenches will not be permitted within 900 mm of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 3meters below the working level.

### 3.5 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

## 3.6 CLASSIFICATION OF EXCAVATION

For estimating purposes, excavation will be unclassified regardless of the nature of material encountered.

### 3.7 BLASTING

Blasting will not be permitted.

### 3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 150 mm below the bottom of the pipe, and the overdepth shall be backfilled with satisfactory material placed and compacted in conformance with paragraph FILLING AND BACKFILLING.

#### 3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02300 EARTHWORK.

### 3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02300 EARTHWORK.

# 3.13 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. Subgrades supporting concrete and fill material supporting footings shall be compacted in accordance with paragraph: SUBGRADE PREPARATION. Building foundations shall bear on a minimum of 610 mm of compacted non-expansive "select material". Excavations for footing shall

be excavated to the design elevation with minimum disturbance to the subgrade. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used. Approximately level surfaces shall be roughened and sloped surfaces shall be cut as indicated in rough steps, or benches to provide a satisfactory bond. Excavations and surfaces supporting concrete shall be clean and thoroughly "crumbed out", being free of clumps of loose earth and unsatisfactory material. If in the opinion of the Contracting Officer a surface supporting concrete has been "softened" due to ponding of water, allowed to dry excessively, freezing, or remolding due to traffic or improper excavation techniques, the material in question shall be replaced as directed by the Contracting Officer. Material removed beneath slabs-on-grade shall be replaced with satisfactory material, compacted to the required density.

### 3.12 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 150 mm before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 150 mm, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 300 mm and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, excessively dry, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

# 3.13 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory materials shall be placed in horizontal layers not exceeding 200 mm in loose thickness, or150 mm when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 600 mm above sewer lines and 300 mm above other utility lines shall be free from stones larger than 25 mm in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 100 mm in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to

drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified.

# Percent Laboratory maximum density

		<del></del>
	Cohesive material	Cohesionless material
	<del></del>	
Fill, embankment, subgrade an	d backfill	
Under structures, building slab steps, paved areas, around footings, and in trenches	90	95
Under sidewalks and grassed are	eas 85	90
Expansive materials	Compacted to not less percent nor more that	
Select Material	90	95

### 3.14 TESTING

All Quality Control Sampling and Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or may be performed by the Contractor subject to approval. Lab or contractor testing approval shall be based on compliance with ASTM E548. No work requiring testing will be permitted until the quality control testing facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. At least two field density tests performed in accordance with D 1556 shall be made daily and used as a check of the results obtained with ASTM D 2922 or ASTM D 3017. Additionally, after every tenth test made in accordance with ASTM 2922, a check of the measured density shall be made in accordance with ASTM 1556. ASTM D 2937 shall be used only for soft, fine-grained, cohesive soils.

Test results shall be furnished the Contracting Officer within 24 hours of making the test. When test results indicate that compaction is not as specified, the material shall be removed and replaced or recompacted to meet specification requirements at no additional cost to the Government.

Subsequent tests on recompacted area shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests.

The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation.

## 3.14.1 In-Place Density

All in-place density and moisture content test results shall be included with the Contractor's daily construction quality control reports.

# 3.14.1.1 In-Place Density of Subgrades

## 3.14.1.2 In-Place Density of Fills and Backfills

One test per 929 square meters or fraction thereof of each lift for fill or backfill areas compacted by other than hand or hand-operated machines. The density for each lift of fill or backfill materials for trenches, pits, building perimeters or other structures with narrow subgrade/fills less than 1 meters in width, which are compacted with hand or hand-operated machines shall be tested as follows: A minimum of one test per 320 linear meters in length. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 at least twice daily.

### 3.14.2 Moisture Content

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D 2216 and checked for compliance with allowable limits relative to the laboratory optimum moisture. Atterberg limits (ASTM D 4318) shall be made by the Contractor in conjunction with each moisture content test in order to establish the material "type" and the corresponding laboratory maximum density. The use of fly ash or other drying agent, approved by the Contracting Officer, to adjust the moisture content of excavated or borrow materials to within acceptable moisture ranges shall be the Contractor's option and shall be made at no additional cost to the Government. The request for approval shall be accompanied with a moisture/density curve developed for the soil in question with the minimum amount of drying agent required to reduce the moisture content from that encountered in situ to the maximum moisture allowed relative to the plastic limit of the modified material. Henceforth, this moisture/density curve with the drying agent incorporated shall be used to determine the maximum laboratory density.

# 3.14.3 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material, including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 250 cubic meters of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

Tests for determination of maximum density and optimum moisture shall be performed by the Contractor in accordance with the requirements of ASTM D 1557 Method B, C, or D, except that a mechanical tamper may be used provided the results are correlated with those obtained with the referenced hand tamper. Samples shall be representative of the materials to be placed. Soils shall be grouped together into "types" such that all members of the "type" have a PI that does not very more than 2 percent plus or minus from the mean PI of the "type". A moisture/density curve shall be made for each "type" material or source of material including borrow materials. Additional moisture/density curve(s) shall be made at the direction of the Contracting Officer, or when any change in material "type" occurs. Included with each moisture/density curve will be a determination of the in situ moisture content determined in accordance with ASTM D 2216 and the Atterberg limits determined in accordance with ASTM D 4318 for materials with 15 percent or more of the total sample passing the #200 sieve. The gradation of materials having 30 percent or more of the total sample retained on the #200 sieve shall be determined in accordance with ASTM D 422. A copy of these tests shall be submitted to the Contracting Officer for approval prior to placement of any fill.

## 3.15.3 CAPILLARY WATER BARRIER

Capillary water barrier under concrete floor and area-way slabs on grade shall be placed directly on the select material subgrade and shall be compacted with a minimum of two passes of a hand-operated plate-type vibratory compactor.

### 3.16 GRADING

Areas within1.5 m outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted. Select material remaining exposed on the ground surface shall be removed from the site and disposed off government property.

# 3.17 SPREADING TOPSOIL

Areas outside the building lines from which topsoil has been removed shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. The subgrade shall be pulverized to a depth of 50 mm by disking or plowing for the bonding of topsoil with the subsoil. Topsoil shall then be uniformly spread, graded, and compacted to the thickness, elevations, slopes shown, and left free of surface irregularities. Topsoil shall be compacted by one pass of a cultipacker, roller, or other approved equipment weighing 1.46 kN/m to 2.34 kN/m of roller. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading.

### 3.18 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades re established to the required elevations and slopes.

Protection of existing vegetation, structures, utilities, and improvements is specified in the CONTRACT CLAUSES. Existing utility lines that are shown on the drawings or the locations of which are made known to the

Contractor prior to excavation and that are to be retained shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his expense. Any existing utility lines that are to be retained and that are not shown on the drawings or the locations of which are not made known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Contractor, and adjustment in payment will be made. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time for the necessary measures to be taken to prevent interruption of the service.

# 3.19 SPECIAL REQUIREMENTS

The material within of the bottom of building slabs-on-grade shall consist of select material and capillary water barrier material. The minimum limits of the area filled with these materials shall be the area inside the foundation walls or, if the building foundation is slab-on-grade, the area within the foot print of the building. The materials within 0.61 meters beneath the base of foundation footings shall also consist of select material as indicated on the contract drawings.

In order to protect the uncovered or placed and compacted expansive soil surface from drying, select material shall be placed on this surface at least 200 mm deep within 48 hours of uncovering or placing and compacting. This layer of select material shall be used as a working platform with excavations for footing and utilities being made through the layer. Any excavations through the working platform shall be backfilled with select material the entire depth of the excavation within 72 hours. An additional 250 mm of select material shall be placed on the working platform subsequent to installation of utilities. One hundred and fifty millimeters of capillary water barrier material shall be placed above the top of this select material. All expansive soil surfaces shall be protected from excessive moisture as directed by the Contracting Officer.

-- End of Section --

### SECTION 02316

# EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS ${\bf 11/97}$

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

# 1.2 DEGREE OF COMPACTION

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

# 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Field Test Control; G-RE

Qualifications of the laboratory who will be performed all testing in accordance with TESTING.

SD-06 Test Reports

Field Density Tests; Testing of Backfill Materials; G-RE.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

### PART 2 PRODUCTS

### 2.1 MATERIALS

# 2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SM, SC, CL, and CH. Lime and flyash shall also be considered as satisfactory materials when used as stabilizing agents.

# 2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Materials classified as MH, Pt, OH, SP, and OL according to ASTM D 2487 are unsatisfactory. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, fine-grained sedimentary rock (i.e shale, clay stone, siltstone, mud stone, and marl) even though they may be intensely weathered;, contamination from hazardous and toxic substances, stone having a maximum dimension larger than 2 inches in the upper 6 inches of fill or larger than 3 inches for the remainder of the fill and other materials that are determined by the Contracting Officer as unsatisfactory for providing a stable subgrade or structural foundation. Otherwise suitable material which contains excess moisture will not be classified as unsuitable material unless it cannot be dried by manipulation, aeration, or blending with other materials (i.e., dry soil, etc.) as approved by the Contracting Officer. The Contracting Officer shall be notified of any contaminated materials.

### 2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

# 2.1.4 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 75 millimeters in any dimension or as defined by the pipe

manufacturer, whichever is smaller.

### 2.1.5 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

### 2.1.6 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a 0.075 mm mesh sieve and no less than 95 percent by weight passing the 25 mm sieve. The portion passing the Number 40 sieve shall classified as either non-plastic or have a plasticity index less than 12. The maximum allowable aggregate size shall be 25 millimeters, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

### 2.2 PLASTIC MARKING TAPE & LOCATOR PEGS

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 152 mm wide with minimum thickness of 0.102 mm (0.004 inch). Tape shall have a minimum strength of 12.1 MPa (1750 psi) lengthwise and 10.3 MPa (1500 psi) crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 1 meter deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Locator Pegs (Passive Transponder) shall be of a type specifically manufactured for electronic marking of underground utilities. The Transponder pegs shall have a polyethylene shell, detachable to a vertical distance of 1.83 meters, and have an accuracy of plus 50 mm. Tape shall bear a continuous printed inscription describing the specific utility. The tape and locator peg color shall be as specified in TABLE 1. The frequency of the locator pegs shall be as specified in Table 2.

TABLE 1. Tape & Locator Peg Color

Red:	Electric

Yellow: Gas, Oil, Dangerous Materials Orange: Telephone, Telegraph, Television,

Police, and Fire Communications

Blue: Water Systems Green: Sewer Systems

TABLE 2. Locator Peg Frequency Requirements

169.8KHz: Electric

83KHz: Gas, Oil, Dangerous Materials
101.4 KHz: Telephone, Telegraph, Television,
Police, and Fire Communications

145.7 KHz: Water Systems

122.5 KHz: Sanitary Sewer Systems

The Transponder pegs shall be manufactured by Communications Technology Corporation in Atlanta, Georgia; or equivalent.

### PART 3 EXECUTION

## 3.1 CLASSIFICATION OF EXCAVATION

For estimating purposes, no consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

# 3.2 EXCAVATION

Excavation shall be performed to the lines and grades indicated. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 600 mm. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING AND COMPACTION at no additional cost to the Government.

### 3.2.1 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 600 mm plus pipe outside diameter (0.D.) for pipes of less than 600 mm inside diameter and shall not exceed 900 mm plus pipe outside diameter for sizes larger than 600 mm inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

# 3.2.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 75 millimeters or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

# 3.2.1.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed to a minimum of 100 millimeters below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

# 3.2.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

# 3.2.1.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

## 3.2.1.5 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

# 3.2.2 Stockpiles

Stockpiles of satisfactory materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government.

# 3.2.3 Dewatering

The Contractor shall take action as required and shall provide and maintain equipment necessary to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry, free of all accumulations of groundwater seepage at all times when the excavation is open until construction of structures and/or installation of the utility is complete to the extent that no damage from hydrostatic pressure, flotation, or other cause(s) will result. Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent practicable without causing damage to adjacent property. Existing drainage facilities may be used for disposal of surface and ground water during dewatering operations subject to prior approval of the Contracting Officer. The Contractor shall be responsible for all damages incurred to existing drainage facilities as a result of the dewatering operation. All pipes or conduits shall be left clean and free of sediment.

### 3.3 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material, select granular material, or initial backfill material as required. Backfill shall be placed in layers not exceeding 150 mm loose thickness for compaction by hand operated machine compactors, and 200 mm loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

### 3.3.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 0.6 meters above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test.

### 3.3.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

## 3.3.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 150 mm loose thickness.

## 3.3.1.3 Bedding and Initial Backfill

Class I bedding and initial backfill shall consist of select granular material of the thickness shown. Bedding and initial backfill material within 1.5 meters outside of building perimeters shall be cohesive material. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

# 3.3.1.4 Final Backfill

The remainder of the trench, except for special materials for roadways, railroads and airfields, shall be filled with satisfactory material.

# 3.3.2 Backfill for Appurtenances

After the manhole, catch basin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 3 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

# 3.4 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the

specific utilities are as follows:

#### 3.4.1 Gas Distribution

Trenches shall be excavated to a depth that will provide not less than 450 mm of cover in rock excavation and not less than 600 mm of cover in other excavation. Trenches shall be graded as specified for pipe-laying requirements in Section 02685 GAS DISTRIBUTION SYSTEM.

### 3.4.2 Water Lines

Trenches shall be of a depth to provide a minimum cover of 1.2 meters from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe. For fire protection yard mains or piping, an additional 150 millimeters of cover is required.

## 3.4.3 Heat Distribution System

Initial backfill material shall be free of stones larger than  $6.3\ \mathrm{mm}$  in any dimension.

# 3.4.4 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 600 mm from the finished grade, unless otherwise indicated. Special trenching requirements for direct-burial electrical cables and conduits are specified in Section: ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

## 3.4.5 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 1 meter below finished grade unless otherwise shown.

# 3.4.6 Locator Pegs

Transponder pegs shall be placed along and above the mains, at all valves, at all service taps, tees and crosses. They shall be no further apart than 15 meters.

### 3.4.7 Excavations and Backfills of Utilities

Excavations and backfills of utilities under buildings founded on expansive soils shall meet all requirements specified in section EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS, paragraph Special Requirements. All utilities shall be excavated through the previously placed working platform. The excavated previously placed select material may be reused. Excavated underlying expansive material shall be considered unsatisfactory. The entire trench backfill including the bedding shall be select granular material. An additional of select material shall be placed above the working platform when installing utilities.

## 3.5 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

# 3.5.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or

may be tested by facilities furnished by the Contractor. Approval of testing facilities shall be based on compliance with ASTM E 548, and no work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the first inspection will be charged to the Contractor.

# 3.5.2 Testing of Backfill Materials

Characteristics of backfill materials shall be determined in accordance with particle size analysis of soils ASTM D 422 and moisture-density relations of soils ASTM D 1557. A minimum of one particle size analysis and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill. One test per lift of backfill for every 200 feet of installation shall be performed.

### 3.5.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 61 meters of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic meters of material used. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. At least one field density test performed in accordance with ASTM D 1556 shall be made daily and used as a check of the results obtained with ASTM D 2922/D 3017. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

### 3.5.4 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to the finished grade surface, the pipe shall be inspected to determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer. Pipe sizes larger than 900 mm) shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgement of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

-- End of Section --

### SECTION 02620

# SUBDRAINAGE SYSTEM 08/97

### PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 478	(1996) Precast Reinforced Concrete Manhole Sections
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3034	(1994) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1992) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F 758	(1993) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F 949	(1994) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings

# 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Filter Fabric; G-RE. Pipe for Subdrains; G-RE.

Certifications from the manufacturers attesting that materials meet specification requirements. Certificates are required for drain pipe,

drain tile, fittings, and filter fabric.

SD-04 Samples

Filter Fabric: Pipe for Subdrains:

Samples of filter fabric, pipe, and pipe fittings, before starting the work.

# 1.3 DELIVER, STORAGE, AND HANDLING

## 1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with minimum handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. During shipment and storage, filter fabric shall be wrapped in burlap or similar heavy duty protective covering. The storage area shall protect the fabric from mud, soil, dust, and debris. Filter fabric materials that are not to be installed immediately shall not be stored in direct sunlight. Plastic pipe shall be installed within 6 months from the date of manufacture unless otherwise approved.

## 1.3.2 Handling

Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried and not dragged to the trench.

### PART 2 PRODUCTS

### 2.1 PIPE FOR SUBDRAINS

Pipe for subdrains shall be of the types and sizes indicated.

# 2.1.1 Plastic Pipe

Plastic pipe shall contain ultraviolet inhibitor to provide protection from exposure to direct sunlight.

## 2.1.1.2 Polyvinyl Chloride (PVC) Pipe and Fittings

Polyvinyl chloride (PVC) pipe and fittings shall conform to ASTM D 3034, Type PSM with a maximum SDR of 35, with flexible elastomeric seal joint or ASTM F 758, Type PS 46, or ASTM F 949 for corugated sewer pipe.

# 2.1.1.3 Pipe Perforations

Water inlet area shall be a minimum of 1,058.4 mm squared per linear meter. Manufacturer's standard perforated pipe which essentially meets these requirements may be substituted with prior approval of the Contracting Officer.

a. Circular Perforations in Plastic Pipe: Circular holes shall be cleanly cut not more than 9.5 mm or less than 4.8 mm in diameter and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be approximately 76.2 mm

center-to-center along rows. The rows shall be approximately 38.1 mm apart and arranged in a staggered pattern so that all perforations lie at the midpoint between perforations in adjacent rows. The rows shall be spaced over not more than 155 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the socket, and perforations shall continue at uniform spacing over the entire length of the pipe.

b. Slotted Perforations in Plastic Pipe: Circumferential slots shall be cleanly cut so as not to restrict the inflow of water and uniformly spaced along the length and circumference of the tubing. Width of slots shall not exceed 3.2 mm nor be less than 0.8 mm. The length of individual slots shall not exceed 31.75 mm on 80 mm diameter tubing, 10 percent of the tubing inside nominal circumference on 100 to 200 mm diameter tubing, and 63.5 mm on 250 mm diameter tubing. Rows of slots shall be symmetrically spaced so that they are fully contained in 2 quadrants of the pipe. Slots shall be centered in the valleys of the corrugations of profile wall pipe.

### 2.2 FILTER FABRIC

Filter fabric shall be a pervious sheet of polyester, nylon, or polypropylene filaments woven or otherwise formed into a uniform pattern with distinct and measurable openings. The filter fabric shall provide an equivalent opening size (AOS) no finer than the US Standard Sieve No. 70 and no coarser than the US Standard Sieve No. 100. AOS is defined as the number of the US Standard sieve having openings closest in size to the filter fabric openings. The filaments shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, or vinylidene-chloride, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The fabric shall have a minimum physical strength of 444.8 N per meter in any direction when tested in accordance with ASTM D 5034 using the grab test method with 645.2 square mm jaws and a constant rate of travel of 304.8 mm per minute. Elongation at failure shall be between 30 and 70 percent. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other. The edges of the fabric shall be selvaged or otherwise finished to prevent the outer material from pulling away from the fabric.

# 2.3 DRAINAGE STRUCTURES

### 2.3.1 Concrete

Except for precast concrete, reinforcement shall conform to the requirements for 21 MPa concrete in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. The concrete mixtures shall have air content, by volume of concrete, based on measurements made immediately after discharge from the mixer of 5 to 7 percent when coarse-aggregate maximum size is 38.1 mm or smaller. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall be not less than 25.4 mm thick for covers and not less than 38.1 mm thick for walls and flooring. Concrete covering deposited directly against the ground shall be at least 76.2 mm thick between the steel and the ground. Expansion-joint filler

material shall conform to ASTM D 1751 or ASTM D 1752. Exposed concrete surfaces, such as drainage structures that form a continuation of concrete curbs and gutters, shall be given a protective coating of linseed oil as specified in Section 02511 CONCRETE SIDEWALKS AND CURBS AND GUTTERS.

### 2.3.2 Mortar

Mortar for pipe joints and connections to other drainage structures shall be composed of one part by volume of portland cement and two parts of sand. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of injurious acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes from the time the ingredients are mixed with water.

# 2.3.3 Manholes and Appurtenances

## 2.3.3.1 Precast Reinforced Concrete Manhole Risers and Tops

Precast reinforced concrete manhole risers and tops shall conform to ASTM C  $_{478}$ 

# 2.4 SUBDRAIN FILTER AND BEDDING MATERIAL

Subdrain filter and bedding material shall be washed sand, sand and gravel, crushed stone, crushed stone screenings, or slag composed of hard, tough, durable particles free from adherent coatings. Filter material shall not contain corrosive agents, organic matter, or soft, friable, thin, or elongated particles and shall be evenly graded between the limits specified in TABLE I. Gradation curves will exhibit no abrupt changes in slope denoting skip or gap grading. Filter materials shall be clean and free from soil and foreign materials. Filter blankets found to be dirty or otherwise contaminated shall be removed and replaced with material meeting the specific requirements, at no additional cost to the Government.

TABLE I. FILTER GRADATION

Sieve Designation	Percent by Weight Passing
38 mm (1-1/2 inch)	100
25.0 mm (1 inch)	95-100
12.5 mm (1/2 inch)	25-60
4.75 mm (No. 4)	0-10
75um (No. 200)	0-2

### PART 3 EXECUTION

## 3.1 EXCAVATION AND BEDDING FOR SUBDRAIN SYSTEMS

Trenching and excavation, including the removal of rock and unstable material, shall be in accordance with Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Bedding material shall be placed in the trench as indicated or as required as replacement materials used in those areas where unstable materials were removed. Compaction of the bedding material shall be as specified for cohesionless material in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

#### 3.2 FLUSHING AND OBSERVATION RISERS

#### 3.2.1 Flushing and Observation Risers

Flushing and observation riser pipes with frames and covers shall be installed at the locations indicated. Risers shall be constructed of precast concrete or galvanized corrugated metal pipe. Joining of riser pipes to the subdrain system shall be as indicated.

## 3.3 INSTALLATION OF FILTER FABRIC AND PIPE FOR SUBDRAINS

## 3.3.1 Installation of Filter Fabric

## 3.3.1.1 Overlaps on Perforated or Slotted Pipes

One layer of filter fabric shall be wrapped around perforated or slotted collector pipes in such a manner that longitudinal overlaps of fabric are in unperforated or unslotted quadrants of the pipes. The overlap shall be at least 50 mm. The fabric shall be secured to the pipe in such a manner that backfill material will not infiltrate through any fabric overlaps.

## 3.3.1.2 Installation on Open-Joint Pipe

One layer of filter fabric shall be wrapped around open joints. The overlap should be at least 50 mm. The fabric shall be secured to the pipe in such a manner that backfill material will not infiltrate through the overlap or the edges of the fabric to either side of the open joint.

#### 3.3.1.3 Trench Lining and Overlaps

Trenches to be lined with filter fabric shall be graded to obtain smooth side and bottom surfaces so that the fabric will not bridge cavities in the soil or be damaged by projecting rock. The fabric shall be laid flat but not stretched on the soil, and it shall be secured with anchor pins.

Overlaps shall be at least 25 mm,  $\,$  and anchor pins shall be used along the overlaps.

## 3.3.2 Installation of Pipe for Subdrains

## 3.3.2.1 Pipelaying

Each pipe shall be carefully inspected before it is laid. Any defective or damaged pipe shall be rejected. No pipe shall be laid when the trench conditions or weather is unsuitable for such work. Water shall be removed from trenches by sump pumping or other approved methods. The pipe shall be laid to the grades and alignment as indicated. The pipe shall be bedded to the established gradeline. Perforations shall be centered on the bottom of the pipe. Pipes of either the bell-and-spigot type or the tongue-and-groove type shall be laid with the bell or groove ends upstream. All pipes in place shall be approved before backfilling.

## 3.3.2.2 Jointings

a. Polyvinyl Chloride (PVC) Pipe: Joints shall be in accordance with the requirements of ASTM D 3034, ASTM D 3212, or ASTM F 949.

## 3.4 INSTALLATION OF AND BACKFILLING FOR BLIND OR FRENCH DRAINS

Filter material shall be placed as indicated and compacted as specified for cohesionless materials in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Filter material shall extend to a suitable outlet or to an outlet through a pipeline as indicated. Overlying backfill material shall be placed and compacted as specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

## 3.5 INSTALLATION OF FILTER MATERIAL AND BACKFILLING FOR SUBDRAINS

After pipe for subdrains has been laid, inspected, and approved, filter material shall be placed around and over the pipe to the depth indicated. The filter material shall be placed in layers not to exceed 200 mm thick, and each layer shall be thoroughly compacted by mechanical tampers to obtain the required density. Compaction of filter material and the placement and compaction of overlying backfill material shall be in accordance with the applicable provisions specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

## 3.6 TESTS

## 3.6.1 Pipe Test

Strength tests of pipe shall conform to field service test requirements of the ASTM specification covering the product (paragraph PIPE FOR SUBDRAINS).

-- End of Section --

## SECTION 02700

# ASPHALTIC CONCRETE INTERMEDIATE LEVELING AND SURFACE COURSES (CENTRAL PLANT HOT MIX) Sept/98

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

Т 168-91	Sampling Bituminous Paving Mixtures
T 248-84	Reducing Field Samples of Aggregate to Testing Size
T 283-89	Resistance of Compacted Bituminous Moisture to Moisture Induced Damage

## ASPHALT INSTITUTE

Manual	Series	No.	2	(MS-2)	Mix	Design	Methods	For	Asphalt	Concrete
						Sixt	th Editio	on		

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS

C 29-91	Unit Weight and Voids in Aggregate
C 88-90	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C 117-90	Materials Finer than 75-um (No. 200) Sieve in Minerall Aggregates by Washing
C 127-88	Specific Gravity and Absorption of Coarse Aggregate
C 128-88	Specific Gravity and Absorption of Fine Aggregate
C 131-89	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C 136-84a	Sieve Analysis of Fine and Coarse Aggregates

C 183-88	Sampling and Acceptance of Hydraulic Cement
C 566-89	Total Moisture Content of Aggregate by Drying
D 75-87	Sampling Aggregates
D 140-88	Sampling Bituminous Materials
D 242-85 (R1990)	Mineral Filler for Bituminous Paving Mixtures
D 1461-85	Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
D1559-89	Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
D 2041-94	Test Method for Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures
D 2172-92	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
D 2726-90	Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
D 3381-92	Viscosity-Graded Asphalt Cement for Use in Pavement Construction
D 4791-89	Flat or Elongated Particles in Coarse Aggregate
D 6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Testing Laboratory, para. 1.6.1; G-RE

The following shall be in one transmittal:

Equipment, para. 2.3; G-GD

Mixing Plant, para. 2.4; G-KC

SD-06 Manufacturer's Field Reports

The following shall be included in the composition of mixture transmittal

Composition of Mixture, para.'s 2.2 thru 2.2.3.1; G-GD

Coarse Aggregate, para. 1.4.2.1.a; G-GD

Fine Aggregate, para. 1.4.2.1.b; G-GD

Mineral Filler, para. 1.4.2.1.c; G-GD

## QC PRODUCTION OF AGGREGATE

Aggregate Gradation, para. 1.4.2.2.a; G-GD

Crushed Particle Test, para. 1.4.2.2.b; G-GD

Specific Gravity Test, para. 1.4.2.2.c; G-GD

SD-13 Certificates

The following shall be included in the composition of the mixture transmittal:

Bituminous Material, para. 1.5; G-GD

## 1.3 DEFINITIONS

## 1.3.1 General

Bituminous intermediate and surface course shall consist of fine and coarse aggregates and mineral filler uniformly mixed with hot bituminous material, and placed and compacted on a prepared base course, or intermediate course. All quality control sampling and testing results and reports shall be included in the Contractor's Daily Quality Control Reports.

## 1.3.2 Aggregates

Aggregates shall consist of crushed stone, crushed gravel, screenings, sand, and mineral filler. The portion of these materials retained on the 4.75 mm (No. 4) sieve shall be known as coarse aggregate; the portion passing the 4.75 mm (No. 4) sieve and retained on the 75 um (No. 200) sieve, as fine aggregate; and the portion passing the 75 um (No. 200), as mineral filler. The coarse and fine aggregates and mineral filler shall be so graded and of such character that when combined, a blend will be produced that will meet the requirements specified in subsequent paragraphs, entitled AGGREGATE GRADATION and COMPOSITION OF MIXTURE.

## 1.3.2.1 The Total Aggregate

The total aggregate (coarse aggregate, fine aggregate, and the material passing the 75 um (No. 200) sieve) shall contain not less than 80 percent crushed material for intermediate course and surface course.

#### 1.3.2.2 Coarse Aggregates

Coarse aggregates shall consist of clean, sound, durable fragments of crushed stone or crushed gravel meeting the following requirements:

- a. Percent of wear shall not exceed 40 after 500 revolutions, as determined in accordance with ASTM C 131-89.
- b. Percentage of loss shall not exceed 18 after five cycles performed in accordance with ASTM C 88-90, using magnesium sulfate.
- c. The dry weight of crushed slag shall not be less than 1,200 Kg/cubic m (75 pcf), as determined in accordance with ASTM C 29-91.
- d. Crushed gravel retained on the 4.75 mm (No. 4) sieve and each coarser sieve shall contain at least 80 percent by weight of crushed pieces having one or more fractured faces with the area of each face equal to at least 80 percent of the smallest mid sectional area of piece. When two fractures are contiguous, the angle between planes of fractures shall be at least 30 degrees to count as two fractured faces.
- e. Particle shape of crushed aggregates shall be essentially cubical. The quantity of flat and elongated particles in any sieve size shall not exceed 20 percent by weight, when determined in accordance with ASTM D 4791-89.

## 1.3.2.3 Fine Aggregate

Fine aggregate shall consist of clean, sound, durable particles including natural sand or crushed stone or gravel that meets requirements for wear and soundness specified for coarse aggregate. Fine aggregate produced by crushing gravel shall have at least 90 percent by weight of crushed particles having two or more fractured faces in the portion retained on the 600 um (No. 30) sieve. This requirement shall apply to the material before blending with natural sand when blending is necessary.

#### 1.3.2.4 Mineral filler

Mineral filler shall conform to ASTM D 242-85 (R1990) and the following additional requirements. At least 50 percent of the mineral filler shall be hydrated lime, limestone dust or Portland cement. However, in areas where long service has shown that there has been no problem with stripping when the proposed aggregates are used, this additional requirement may be waived by the Contracting Officer when requested in writing.

#### 1.4 SAMPLING AND TESTING OF AGGREGATES

#### 1.4.1 General

Sampling shall be performed in accordance with ASTM D 75-87 for aggregates and ASTM C 183-88 for mineral filler, unless otherwise directed. Quality control tests shall be performed at the frequency specified hereinafter. Aggregates shall not be delivered to the job site or used in the production of bituminous mixtures without prior approval.

## 1.4.2 Preconstruction Aggregate Testing

## 1.4.2.1 Initial tests (SD09-GA)

Initial tests (SD09-GA)

The Contractor shall perform the following tests on the aggregates prior to designing the mix.

- a. Coarse aggregate: Wear (abrasion) test, soundness test, gradation test, and specific gravity test. A crushed particle (fractured-faces) test shall be performed unless the coarse aggregate consists of crushed quarried rock.
- b. Fine aggregate shall be tested to determine compliance with specification requirements and gradation.
- c. Mineral filler shall be tested to determine compliance with specification requirements.
- 1.4.2.2 Quality control tests (SD09-GA)

Quality control tests (SD09-GA)

During production, aggregates shall be sampled and tested, as required. The test results reported for these samples will be the basis of approval of specific lots of aggregates for the gradation and paving-mixture requirements. Gradation and specific gravity shall not vary significantly. The frequency of testing shall be as follows:

- a. One gradation test of aggregate for every 1,000 Metric tons (1,100 tons) of each size of aggregate as it is stockpiled.
- b. One crushed particle (fractured faces) test for every 1,000 Metric tons (1,100 tons) of each size of coarse aggregate as it is stockpiled unless the material consists of crushed quarried rock or unless otherwise approved.
- c. One specific gravity test for every 1,000 Metric tons (1,100 tons) of each size grouping of aggregate stockpiled.
- 1.5. BITUMINOUS MATERIALS (SD13-GA)

Bituminous material shall not be incorporated into the mix without prior approval. Bituminous materials to be mixed with mineral aggregates shall conform to the following:

## 1.5.1 Asphalt Cement

Asphalt cement shall conform to ASTM D 3381-92, viscosity grade: AC-20. A certified refinery analysis from the proposed source shall be furnished.

- 1.6 QUALITY CONTROL
- 1.6.1 General (SD08-GA)

All quality control sampling and testing shall be the responsibility of the Contractor in accordance with SECTION: CONTRACTOR QUALITY CONTROL and as

specified herein. All sampling and testing shall be performed by a commercial testing laboratory with the capability of performing all the testing specified herein and shall be supervised by a registered professional engineer. The Contractor may elect to establish testing facilities of his own. The Contractor's laboratory shall have the capability of performing all the testing specified herein. Approval of such facilities shall be based on compliance with ASTM E 548 No work requiring testing will be permitted until the Contractor's facilities have been inspected and approved. The Contractor's testing laboratory shall be supervised by a registered professional engineer. The first inspection of the facilities shall be at the expense of the Government and any subsequent inspections required because of failure of the first inspection shall be at the expense of the contractor. Such costs will be deducted from the total amount due the Contractor. The Government may perform verification tests as considered necessary.

## PART 2 PRODUCTS

#### 2.1 AGGREGATE GRADATION

Mineral aggregate shall be of such size that the percentage composition by weight, as determined by ASTM C 136-84a and C 117-90, will generally conform to the gradation shown below for the specific course shown on the drawings. Regardless of the gradation chosen by the Contractor, it shall be his responsibility to furnish a combined aggregate which will produce a bituminous mixture meeting all requirements specified herein, particularly those specified in paragraph: COMPOSITION OF MIXTURE and any aggregate gradation which fails to produce a bituminous mixture meeting all requirements specified shall be rejected and replaced with a satisfactory aggregate gradation at no additional cost to the Government, and with no extension of time due to any delay caused by such replacement.

## Percentage Passing, by Weight

Sieve Size	Intermediate Course	Surface course
25.0 mm (1 inch)	100	
19.0 mm (3/4 inch)	95-100	100
12.5 mm (1/2 inch)		
9.5 mm (3/8 inch)	70-90	79-94
4.75 mm (No. 4)		60-77
2.36 mm (No. 8)	28-58	44-62
1.18 mm (No. 16)		
600 um (No. 30)	12-36	22-39
300 um (No. 50)		
150 um (No. 100)		
75 um (No. 200)	2-7	2-7

Note: The job mix formula may have to fall outside the gradation band shown above in order to meet the test properties of the mixture shown in paragraph: COMPOSITION OF MIXTURE.

## 2.2 COMPOSITION OF MIXTURE (SD09-GA)

## 2.2.1 Job-Mix Formula

The bituminous mix design shall be established by a laboratory approved as specified in paragraph: QUALITY CONTROL using the materials and properties

specified herein. Certified test results of the job-mix formula and materials shall be submitted for approval at least 30 days prior to commencing construction to the Kansas City District, Attention ED-GL. No bituminous mixture shall be produced until the job-mix formula has been approved by the Contracting Officer. The formula will indicate the percentage of each sieve fraction of aggregate, and the percentage of asphalt and temperature of completed mixture when discharged from mixer. The job-mix formula will be allowed the following tolerances.

Aggr. passing 4.75 mm (No. 4) sieve or larger plus or minus 5%

Aggr. passing 2.36~mm (No. 8), 1.18~mm (No. 16), plus or minus 4% 600 um (No. 30), and 300 um (No. 50) sieves

Aggregate passing 150 um (No. 100) plus or minus 2% and 75 um (No. 200)sieves

Asphalt as determined by extraction tests plus or minus 0.25%

Temperature of mixing plus or minus 14 degrees C (+/- 25 degrees F)

The bitumen content and aggregate gradation may be adjusted within the limits of the tables specified herein to improve the paving mixtures, as directed. The percentages of each sieve fraction in the job-mix formula will be restricted to values such that the application of the above-listed tolerances will not cause the limits of the gradation tables to be exceeded.

NOTE: It shall be noted that when the gradation varies appreciably from the single point gradation used in the mix-design, the test properties of the mix will be out of specifications and the mix-design will have to be adjusted or redesigned. This condition can occur even though the gradation meets the tolerances specified above.

## 2.2.2 Mineral Filler and Hydrated Lime

The mixtures shall contain one percent hydrated lime by weight of the total aggregate, however this maybe waived as stated in Part 1, paragraph, Mineral filler. The hydrated lime shall be added during, or ahead of, the addition of the asphalt cement. If minus No. 200 material is needed in addition to the one percent hydrated lime to comply with gradation requirements, mineral filler shall be added.

## 2.2.3 Test Properties of Bituminous Mixtures

The finished mixture shall meet the requirements described below when tested in accordance with ASTM D1559-89 and the volumetric properties of compacted paving mixtures as calculated by ASTM procedures using Chapter 4 of the Asphalt Institute's Manual Series No. 2 (MS-2). The automatic Marshall Hammer may be used when it has be calibrated with a manual hammer. The material for the theoretical specific gravity ASTM D 2041-94 and the material for the Marshall specimens (pucks) shall be cured at 135 degrees C (275 degrees F) for 2 hours in a closed oven after the mix is produced in the laboratory. Also the plant-produced mixture shall not be tested until the mix is 2 hours old. The mixture shall not be reheated. The above procedure shall be used when the water-absorption as determined by ASTM C 127-88 and ASTM C 128-88 of any aggregate in the mixture exceeds 1.25 percent. All samples will be compacted with 50 blows of specified hammer

on each side of sample. When bituminous mixture fails to meet the requirements specified below, the paving operation shall be stopped until the cause of noncompliance is determined and corrected.

## 2.2.3.1 Stability, Flow and Voids

The mixture shall meet the following requirements:

Test Property	Surface	Intermediate
	Course	Course
Stability, minimum	5300 N (1200 lbs)	5300 N (1200 lbs)
Flow, maximum, 0.254 mm (1/100-inch) units	16	16
Voids, total mix, percent (see Note 1)	3-5	3-5
% Voids in Mineral Aggregate (VMA)	(See Note 2)	
Voids filled with asphalt; percent (VFA)	65-75	65-75
The ratio of minus No. 200 material to %effective asphalt cement based on the weight of the aggregate	0.6-1.2	0.6-1.2

- Note 1: The laboratory job mix formula shall have the percent voids in the total mix between 4 and 4.5 percent air voids. The voids in the total mix of the mix produced at the plant shall be continually adjusted to ensure the voids stay near the middle of the range of 3 to 5 percent.
- Note 2: The minimum VMA percent shall conform to the requirements specified in Table 5.3, Chapter 5 of the Asphalt Institute manual MS-2. To insure that the VMA is not to high, the gradation of the verified mix design behind the paver shall be adjusted to meet the requirements of the VMA as stated in Chapter 5, paragraph "Evaluation of VMA Curve" of the Asphalt Institute manual MS-2. The asphalt content should be just to the left-hand side of the low point on the VMA versus Asphalt Content percent, not on the wet or right-hand increasing side of the curve.
- Note 3: When the absorption is high, the mixture will be tender until the asphalt is absorbed into the aggregate. Therefore, it may be beneficial to silo the mixture at the plant for a time. This is more important when the truck haul is short.
- c. Reduction in strength by saturation with water: The index of retained strength must be greater than 75 percent as determined by AASHTO T 283-89. Specimens shall be conditioned by freezing and thawing. When the index of retained strength is less than 75, the aggregate stripping tendencies may be countered by the use of hydrated lime or by treating the bitumen with an approved anti stripping agent. The hydrated lime is considered as mineral filler and should be considered in the gradation

requirements. The amount of hydrated lime or anti stripping agent added to bitumen shall be sufficient, as approved, to produce an index of retained strength of not less than 75 percent. No additional payment will be made to the Contractor for addition of anti stripping agent required.

- d. Extraction test shall be performed using ASTM D 2172-92 or D 6307.
- 2.2.4 Sampling, Testing, and Approval of Bituminous Mixtures During Construction:

#### 2.2.4.1 General

Samples of plant mixtures shall be taken to determine conformance to the specified test properties of bituminous mixtures and to determine bitumen content and aggregate gradation. Quality Control sampling and testing shall be performed by the same testing laboratory that established the mix design. The Quality Control laboratory shall be approved as specified in paragraph: QUALITY CONTROL and as specified herein. All tests shall be performed expeditiously and results immediately furnished to the Contractor and Government representatives at the construction site or mixing plant. As a minimum the test results shall be reported on a form similar to the form "ASPHALTIC CONCRETE TEST" attached at the end of this Specification Section. Back up calculations shall be available at the laboratory and submitted in the project final report. If the mixture is out of specification or near the specified limits, the test report shall contain recommendations of how to correct the mix proportions. Construction operations shall cease when test results are not received and adjustments made within six hours after the mix comes out of the plant. The Government may perform verification tests as considered necessary. Mixtures that do not conform to the specified test properties shall be rejected. No payment will be made to the Contractor for mixtures rejected, for additional retesting, or for pavements or portions of pavement removed. T 168-91 Sampling Bituminous Paving Mixtures and T 248-84 Reducing Field Samples of Aggregate to Testing Size are to be used for sampling.

## 2.2.4.2 Testing frequence

- a. One gradation test of hot bin material for conventional plants, or total aggregate material from the final feed belt for the dryer-drum mixer for dryer-drum plants, for each 500 Metric tons (550 tons) of hot mix produced. A minimum of two tests per day and a maximum of three tests per day during hot mix production will be required.
- b. Two gradation tests of hot bin material for conventional plants, or total aggregate material from the final feed belt for the dryer-drum mixer for dryer-drum plants, during trial runs performed 10 days before start of production of paving mixtures. Additional tests may be directed by the Contracting Officer when necessary to adjust the plant.
- c. Marshall tests: In order to verify the mix design the first set (3 specimens) of tests shall be taken when the plant has produced approximately 75 Metric tons (82.5 tons) of hot mix. Testing shall be repeated until the tests verify that the hot mix produced meets all the properties specified in paragraph: Test properties of bituminous mixtures. After verification of the mix one set (3 specimens) of tests shall be made for each 300 Metric tons (330 tons) of hot mix produced, except that a minimum of two sets per day and a maximum of four tests per day, shall be made. Test shall be taken from the placed bituminous mixture prior to

compaction. Material for the sample shall be taken from the following locations; one each side of the placed bituminous mat and one in the center of the mat. A square pointed shovel shall be used for taking the sample and for evenly laying material back into the disturbed mat.

d. Extraction tests shall be made to determine bitumen content and aggregate gradation at the same frequency specified above for Marshall Tests. Gradation test shall also be made when new aggregate is delivered to the plant.

NOTE: The results of the gradation test are very important in determining how to adjust the mix. After the gradation or the bitumen content has been adjusted to obtain the properties of the mix, this verified mix design becomes the project mix design. The plant settings may have to be adjusted again whenever the gradation of the materials change. When a change is made, it shall be reported on the Marshall Test Report form.

- e. Paving shall stop and the mixture shall be redesigned whenever any of the following occurs; three consecutive sets of Marshall tests show the percent voids in the total mix are less than 3 percent or more than 5 percent; two consecutive sets of Marshall tests show the percent voids in the total mix are less than 2 percent; two consecutive Marshall tests show the voids filled with asphalt exceed 79 percent.
- f. Retained strength tests: One set of tests shall be made for the first day's construction and thereafter whenever there is any change in materials or job-mix formula.
- g. Moisture tests: The bituminous mixture shall be sampled and tested for moisture in accordance with ASTM D 1461-85 each time a gradation test is performed. Tests shall be taken from the placed bituminous mixture prior to compaction. Additional test shall be made when a significant change in the stockpiles occurs such as rain, delivery of new aggregates, or when visual inspections of the mix leaving the plant show segregation of asphalt resulting from escaping water vapor in the prepared mixture.
- h. Sampling, testing, and approval of bituminous materials: During construction the Contractor shall furnish asphalt samples and certified test analysis for each shipment of material delivered to the project. The Government may perform verification tests as considered necessary. During construction, the Contractor shall furnish samples of each shipment of bituminous material received at the project and the samples will be tested and/or retained by the Government for record purposes until the completion of the contract. Sampling shall be in accordance with ASTM D 140-88.
- 2.3 APPROVAL OF PLANT, EQUIPMENT, MACHINES, AND TOOLS (SD08-GA)

All equipment used shall be subject to approval. Tentative approval of specific items shall be obtained before start of operations. Final approval will be given only after full-scale production has begun. All plant equipment, tools and machines used in the work shall be maintained in a satisfactory working condition at all times.

2.4 MIXING PLANTS (SD08-GA)

Mixing plants shall meet the requirements of the State of Missouri Department of Transportation's latest specification in effect when this project contract is awarded to the Contractor, except the temperature of the asphalt shall not exceed 162.8 degrees C (325 degrees F) at anytime and the mixture discharged from the plant shall not exceed 148.9 degrees C (300 degrees F), or shall conform to the requirement hereinafter. The plant may be either a weigh-batch type or a continuous-mixing type of conventional plant or a dryer-drum mixing type plant provided the equipment has demonstrated suitability for producing finished mixtures similar to those required by these specifications. The plant shall have a suitable capacity to accomplish the work. Plants shall conform to subparagraph: Requirements for All Plants, except that scale requirements apply only when weight proportioning is used, and in addition, shall conform to subparagraph: Special Requirements for Batch-Mixing Plants or Special Requirements for Conventional Continuous-Mixing Plants, below, as applicable.

#### 2.4.1 Requirements for All Plants

These requirements apply to dryer-drum mixing process plants only as specifically referenced hereinafter.

## 2.4.1.1 Plant scales

Plant scales for any weigh box or hopper shall be of standard make and design, either of the beam or the springless-dial type and shall be sensitive to 0.5 percent of the maximum load required. Beam-type scales shall have a separate beam for each size aggregate, with a single telltale actuated for each beam, and a tare beam for balancing the hopper. Standard test weights accurate to plus or minus 0.1 percent shall be provided for checking plant scales

## 2.4.1.2 Equipment for preparation of bituminous material

Tanks for storage of bituminous material shall be capable of heating the material, under effective and positive control at all times, to the temperatures specified herein. Heating shall be accomplished by steam coils, hot oil or electricity. Continuous circulation between storage tank and mixer during the entire operating period shall be provided. Pipelines and other bituminous handling equipment shall be stream-jacketed or otherwise properly insulated to prevent heat loss. The storage-tank capacity shall be sufficient for at least a 1-day run.

## 2.4.1.3 Feeder for dryer

The plant shall be provided with adjustable mechanical feeders that feed each aggregate individually and in ratios required. Feeders shall have accurate and separate adjustments for proportioning each aggregate to be incorporated into the mix. Gates or other proportioning devices shall have locks for fastening the devices in any desired position. A separate bin or compartment shall be provided for each aggregate to be fed into the dryer.

## 2.4.1.4 Rotary Dryers

Rotary dryers shall be provided in sufficient numbers to heat and dry the aggregates to the temperature and the moisture content specified herein.

## 2.4.1.5 Plant Screens

Plant screens shall be capable of screening dry aggregate output of the dryers to the sizes required for proportioning into the mix. The screen sizes shall be such as to properly fractionate the aggregates so that the total aggregate mixture may be controlled within the tolerances of the job-mix formula at operating capacity.

#### 2.4.1.6 Bins

Bins of sufficient capacity to continuously supply the mixer when it is operating at full capacity shall be provided. The bins shall be divided into at least three compartments, arranged to insure separate and adequate storage of appropriate fractions of the aggregate. Each compartment shall be provided with an overflow pipe of such size and at such location as to prevent any backing up of material into other bins. Approved dry storage shall be provided for mineral filler; and provisions shall be made for accurately weighing or proportioning the mineral filler to the mixtures. Each aggregate bin shall be equipped with mechanical or electrical telltales to indicate when the aggregate in the bin is below the level that will permit accurate proportioning of the aggregate to the mixing unit. Each bin shall be constructed or equipped in such manner that a representative sample of hot aggregate may be readily and safely taken from each bin during plant operations.

#### 2.4.1.7 Bituminous control unit

Satisfactory means, incorporating either weighing, metering, or volumetric measurements, shall be provided to obtain the required percentage of bitumen in the mix within the tolerances specified. When the quantity of bitumen is controlled by metering, provision shall be made whereby the amount of bitumen delivered through meter can be readily checked by weight.

## 2.4.1.8 Thermometric equipment

An armored thermometer with a range of 93.3 to 204.4 degrees C (200 to 400 degrees F) shall be fixed in the bituminous feed line near the discharge valve at the mixture unit. The plant shall be further equipped with an approved recording dial-scale, a mercury-actuated thermometer, or an electric pyrometer so placed at the discharge chute of the dryer as to register automatically or indicate the temperature of the heated aggregate.

## 2.4.1.9 Control of mixing time

Unless otherwise directed, the plant shall be equipped with positive means for governing and maintaining time of mixing constant. Interval of mixing shall be in accordance with subparagraphs: Mixer Unit for Batch Method and Mixer Unit for Continuous Method, specified below.

#### 2.4.1.10 Dust collectors

The plant shall be equipped with dust collectors. Provisions shall be made to waste collected material or to return all or any part of the collected material uniformly to the mixture, as directed.

## 2.4.2 Special Requirements for Batch-Mixing Plants

## 2.4.2.1 Weigh box or hopper

Equipment shall include means for accurately weighing each bin size of

aggregate in a weigh box or hopper suspended on scales, and these weigh boxes or hoppers shall be ample in size to hold a full batch without running over. The gates on both the bins and hoppers shall be constructed to prevent leakage of aggregate when closed. On manually operated plants, an interlocking device shall be provided to prevent opening more than one gate at a time. On automatic plants designed for simultaneous weighing of all sizes of aggregate, this provision does not apply while the plant is operating under automatic control.

## 2.4.2.2 Weigh bucket

The bitumen bucket shall have sufficient capacity to hold not less than 10 percent in excess of the weight of the bitumen required for one batch. The bitumen bucket shall be suspended on dial or beam scales equipped with a telltale so that the tare weight of the bucket will be shown for each weighing, and the net weight of the bituminous material will be measured within plus or minus 1 percent of the weight required. Use of a volumetric-metering-type device that will proportion the bitumen into the mix with the above accuracy will be permitted. The bucket shall be so arranged that the heated bituminous material will be delivered in a thin, uniform sheet, or in multiple streams the full width of the mixer, except in the case of a mixer where bituminous material is sprayed.

## 2.4.2.3 Mixer unit for batch method

The mixer shall be an approved twin-pug mill capable of producing a uniform mixture within job-mix tolerance specified. Batch capacity of the mixer shall be suitable to accomplish the work. The mixer shall have a time lock, accurate within five seconds, to control operation of the complete mixing cycle by locking the weigh-box gate after the mixer is charged until closing of the mixer gate at the completion of the cycle. The time lock shall lock the bitumen bucket throughout the dry-mixing period and shall lock the mixer gate throughout the dry and wet-mixing periods. The dry-mixing period is defined as the interval of time between opening of the weigh-box gate and application of bituminous material and opening of the mixer gate. Control of the time shall be flexible and capable of being set at intervals of not more than 5 seconds throughout cycles up to 3 minutes. A mechanical batch counter shall be installed as part of the timing device and shall be designed to register only the actuation of the bituminous-bucket release and to preclude register of any dry batches, or the register of any material through the operation of pulling bins. If not enclosed, the mixer box shall be equipped with an adjustable hood to prevent loss of mineral filler by dispersion. The clearance of the blades from all fixed parts shall not exceed 19.1 mm (3/4-inch).

## 2.4.3 Special Requirements for Conventional Continuous-Mixing Plants

## 2.4.3.1 Gradation control unit

The plant shall include means for accurately proportioning each bin size of aggregate either by weighing or measuring volumetrically. When gradation control is by volume, the unit shall include a feeder mounted under the compartment bins. Each bin shall have an accurately controlled, lockable gate for volumetrically measuring material to be drawn from it. Indicators shall be provided on each gate to show the gate opening in inches.

## 2.4.3.2 Weight calibration of aggregate feed

The plant shall include means for calibration of gate openings by weight of

test samples. The materials fed out of the bins through the individual orifices shall be bypassed to suitable test boxes. The plant shall be equipped to handle conveniently such test samples weighing approximately 181.4 Kg (400 pounds) combined weight of samples from bins, and not less than a 45.4 Kg (100 pounds) sample from any one bin. The size of the sample may be increased to 362.9 Kg (800 pounds) when so directed. A platform scale having sufficient capacity to accurately weigh the samples shall be provided. Mechanical means shall be provided to accurately proportion the mineral filler to the mixing plant.

## 2.4.3.3 Synchronization of aggregate and bitumen feed

Approved means shall be provided for interlocking control between flow of aggregate from bins and flow of bitumen from meter or other proportioning device.

## 2.4.3.4 Mixer Unit for Continous Method

The mixer unit for continuous method shall be of an approved twin-pug mill type capable of producing a uniform mixture within the job-mix tolerances specified. Blades shall be adjustable for angular position on the shafts and reversible to retard the flow of the mix. The mixer shall bear a manufacturer's plate indicating the net volumetric contents of the mixer at the several heights inscribed on a permanent gate and the rate of feed of aggregate per minute of plant-operating speed. Unless otherwise required, determination of mixing time shall be by weight method, using the following formula.

Mixing time in seconds = pug mill dead capacity in pounds
pug mill output in pounds per second

Weights for the job will be determined by tests made by the Contracting Officer.

## 2.4.3.5 Discharge hopper

The pug mill shall be equipped with a discharge hopper having a capacity of approximately 910 Kg (1 ton). The hopper shall be equipped with dump gates that permit rapid and complete discharge of the bituminous mixture without segregation.

## 2.4.4 Requirements for Dryer-Drum Mixing Plants

Dryer-drum mixing plants shall conform to the following requirements. Equipment for preparation of bituminous material; feeder for dryer; thermometric equipment; and safety requirements shall be as specified in paragraph: REQUIREMENT FOR ALL PLANTS.

## 2.4.4.1 Aggregate supply and control

At least two aggregate storage bins shall be furnished and used to feed at least two separate sizes of aggregate. Each bin shall have the feed rate controlled by a variable speed belt, or a remotely operated gate, calibrated to accurately deliver any specified quantity of material. The feed rate from each bin shall be readily adjustable from the control panel to change aggregate proportions of aggregate from each bin when the combined aggregate delivery is increased or decreased. The combined aggregate belt feeding type dryer-drum shall be equipped with an approved

belt scale. The belt scale shall operate automatic controls which will maintain the established proportion of the bitumen and the total aggregate, with provisions for readily changing the proportions. Approved means shall be provided for storing, metering, and feeding mineral filler as a separate material when a separate mineral filler is necessary.

#### 2.4.4.2 Bituminous control unit

Approved means shall be provided to inject the required percentage of bitumen in the mix within the tolerances provided. Injection shall be so designed and controlled that no detrimental effect takes place form too close contact with dryer flame. Control of the quantity of bitumen injected shall be automatically linked to the aggregate feed scales as specified in the previous subparagraph. Provision shall be made so the amount of bitumen delivered can be checked by weight. Approved steam-jacketing or other insulation for maintaining the required temperature of bitumen in pipelines, meters, spray nozzles, etc., shall be provided. The system shall be capable of maintaining a continuous circulation of bituminous material.

## 2.4.4.3 Dryer-drum mixer

The dryer-drum mixer shall be an approved unit specially made for such operation by a manufacturer regularly engaged in production of such units and shall be a model which has a satisfactory record of use on previous jobs. Capacity shall be sufficient to supply the work under this contract without delay to any part of the construction operations. The unit shall be capable of effectively heating and drying the mineral aggregate as required and of effectively and completely combining the bitumen and all other materials into a uniform mixture with all aggregate particle thoroughly coated. Approved means shall be provided to maintain a constant rate of rotation of the dryer drum. The unit shall be equipped with automatic burner controls and shall provide approved means for temperature sensing of the bituminous mixture at discharge.

## 2.4.4.4 Holding bins

An approved holding bin or bins shall be provided to receive the hot bituminous mixture as it discharges from the mixer.

## 2.5 OTHER EQUIPMENT

## 2.5.1 Bituminous-Materials Spreaders

Bituminous-materials spreaders shall be the self-propelled type equipped with hoppers, tamping, or vibrating devices, distributing screws, adjustable screeds operated either manually or automatically, equipment for heating the screeds and equalizing devices. The spreader shall be capable of spreading hot bituminous mixtures without leaving indented areas, tearing, shoving, or gouging and capable of producing a finished surface conforming to the smoothness requirements specified hereinafter. The spreader shall be capable of spreading hot bituminous mixtures without leaving indented areas, tearing, shoving, or gouging and capable of confining edge of strips to true lines without use of stationary side forms and capable of placing the course to the required thickness. If an

automatic grade control device is used on the spreader for two-lane paving operations, it shall consist of sensing device for control of one end of the screed and a slope-control mechanism for control of the other end of the screed, or a sensing device on each side of the paving machine. Where the paver is used on multiple paving lanes (more than two paving lanes), sensing devices shall be used on each side of the spreader for control of the screed. The slope-control mechanism shall not be used for grade control in multiple paving lane operations.

## 2.5.2 Steel-Wheel Rollers

Steel-wheel rollers shall be self-propelled, three-wheel, (two-axle) and tandem (two-axle) types, weighing not less than 9,071.8 Kg (20,000 pounds) each. The three-wheel rollers shall have a minimum weight of 136 Kg per mm of width (300 pounds per inch of width) of rear wheel. Wheels shall be equipped with adjustable scrapers, water tanks, and sprinkling apparatus for keeping the wheels wet; thereby preventing the bituminous mixture from sticking to the wheels. Rollers shall be capable of reversing without backlash and free from worn parts. Roller wheels with flat and pitted areas or protections that leave marks in the pavement will not be permitted. Three-axle tandems will be permitted in lieu of two-axle tandems if approved by the Contracting Officer.

## 2.5.3 Heavy Pneumatic-Tired Rollers

Heavy pneumatic-tired rollers shall be self-propelled and shall consist of two axles on which are mounted multiple pneumatic-tire wheels in such manner that the rear group of wheels will not follow in the tracks of the forward group but spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be smooth and capable of being inflated to at least 621 KPa (90 p.s.i.) Construction of the roller shall be such that each wheel can be loaded to a minimum of 2,040 Kg (4,500 pounds).

## 2.5.4 Blowers and Brooms

Blowers and brooms shall be power type and suitable for cleaning the surface to be paved.

### 2.5.5 Saw and Core Drill

Saw and core drill shall be of the power type. The saw shall be capable of rapidly cutting pavement samples and trimming joints and edges of pavement. The core drill used for obtaining pavement samples shall be equipped with a diamond, tungsten carbide, or other bit capable of rapidly cutting a precision core sample 101.6 mm (4 inches) in diameter.

## 2.5.6 Small Tools

Small tools shall consist of rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heater for heating small tools, stilt sandals, and other small tools in numbers as required.

## PART 3 EXECUTION

#### 3.1 WEATHER LIMITATIONS

Bituminous courses shall be constructed only when the base course or intermediate course is dry and when the weather is not rainy. Unless otherwise directed, asphalt courses shall not be constructed when the temperature of the surface of existing pavement or base course is below 4.4 degrees C (40 degrees F).

#### 3.2 PREPARATION OF SURFACE

#### 3.2.1 Bituminous mixtures

Bituminous mixtures shall not be placed with-out ample time to complete spreading and rolling during daylight hours, unless approved satisfactory artificial lighting is provided. Immediately prior to placing the bituminous base or surface course, all loose material, dirt, clay, or other objectionable material shall be removed from the surface.

#### 3.2.2 Flexible Pavement Sublayers

If the surface of the underlying material has been damaged after placement or has inadequate compaction (soft spots) or other deviations from this contract specification requirements, such defects shall be repaired immediately prior to placement of the bituminous course. Trucks delivering materials shall be routed in a manner to minimize traveling over the subgrade during the placement operation. Paving operations shall be conducted in such a manner to prevent runoff water from being ponded on the subgrade in case of rain.

### 3.3 GRADE CONTROL

The lines and grades shown on the contract drawings shall be established and maintained by means of line and grade stakes placed at the site of the work by the Contractor in accordance with CONSTRUCTION CLAUSE: LAYOUT OF WORK. Elevations of bench marks used by the Contractor for controlling pavement operations at site of work will be determined, established, and maintained by the Government. Finished pavement gradelines and elevations shown shall be established and controlled at site of work by the Contractor in accordance with bench mark elevations furnished by the Contracting Officer.

## 3.4 MIXING

The bituminous mixtures shall be produced in a plant as specified hereinafter.

#### 3.4.1 Conventional Plant

## 3.4.1.1 Preparation of mineral aggregates

Each component of various-sized aggregates blended in preparation of the bituminous mixture shall be placed and maintained in separate stockpiles. Various-sized aggregates shall be stockpiled to prevent segregation or intermixing. Bulldozers shall not be used for stockpiling aggregates or feeding aggregates to plant. The aggregate shall be fed into the cold elevator by separate mechanical feeders in a manner that will produce an aggregate graded within the requirements of the job mix formulas and

tolerances specified. The aggregates shall be heated and thoroughly dried before entering the hot bins. The temperature and moisture content of the aggregate determined as it enters the mixer shall be uniform and such that the temperature and moisture content of the finished mixture will be uniform and within the tolerances specified. The heated and dried aggregates shall be screened and conveyed to separate hot bins ready for mixing with the bituminous material. The aggregate shall be separated into the sizes designated or approved, except that hot aggregate shall be separated into not less than three sizes. Approved dry storage shall be provided for mineral filler.

#### 3.4.1.2 Preparation of bituminous mixtures

Each size of aggregate, prepared as specified herein before, and dry mineral filler shall be accurately weighed or measured and conveyed into the mixer in the proportionate quantities required to meet the job-mix formula. The required amount of asphalt for each batch or calibrated amount for continuous mixing, shall be introduced into the mixer. In batch mixing, after the aggregates and mineral filler have been introduced into the mixer and mixed for not less than 5 seconds, the asphalt shall be added and the mixing continued for not less than 20 seconds and as much longer as may be required to obtain a homogeneous mixture. When a continuous mixer is employed, the mixing time shall be not less than 25 seconds, and as much longer as may be required to obtain a homogeneous mixture. Additional mixing time when required will be determined by the Contracting Officer. In no case shall the aggregate be introduced into the mixer at a temperature more than (-) 4 degrees C (25 degrees F) above the temperature of the asphalt. The temperature of the asphalt at the time of mixing shall not exceed 163 degrees C (325 degrees F). The temperature of the aggregate and mineral filler in the mixer shall not exceed 177 degrees C (350 degrees F) when the asphalt is added. However, the temperature discharged from the plant shall not exceed 149 degrees C (300 degrees F). The temperatures of both the aggregate and asphalt at the time of mixing and the additional mixing time required shall be as determined by the Contracting Officer. When the mixture is prepared in a twin-shaft pug mill mixer, the volume of the aggregates, mineral filler, and asphalt shall not be so great that the mixture extends above the tips of the mixer blades when the blades are in a vertical position. All overheated and carbonized mixtures or mixtures which foam or show indications of moisture will be rejected. When moisture is detected in the finished mixture, all aggregate in the bins shall be removed immediately and returned to the respective stockpiles.

## 3.4.1.3 Water content of aggregates

During drying operations, the water content shall be reduced to less than 0.25 percent for aggregate blends with water absorption of 2.5 percent or less, and to less than 0.50 percent for aggregate blends with water absorption greater than 2.5 percent, absorption to be determined by ASTM C 127 and C 128. The water absorption for the aggregate blend shall be the weighted average of the absorption value for the coarse aggregate and the fine aggregate. The water content test shall be conducted in accordance with ASTM C 566-89. Water content for the blend will be a weighted average based on the composition of the blend.

## 3.4.2 Dryer-Drum Mixer

## 3.4.2.1 Preparation of mineral aggregates

The mineral aggregate shall be furnished in at least two separate sized materials. Each component of the various-sized aggregates to be blended in preparation of the bituminous mixture shall be placed in separate stockpiles in such manner that the separate sizes will not be intermixed and that segregation does not take place. Each size shall be stored in a separate bin without mixing, for feeding the dryer-drum mixer. The aggregate shall be fed into the dryer-drum mixer by the equipment previously specified in such manner that will produce a total aggregate graded within the requirements of the job-mix formula and tolerances specified. Moisture content of the aggregates fed to the dryer-drum mixer shall be as necessary to produce a bituminous mixture meeting all specified requirements.

## 3.4.2.2 Preparation of bituminous mixture

The aggregates and mineral filler shall be accurately weighed using the specified equipment and conveyed to the dryer-drum mixer in amounts required to conform to the job-mix formula. The required amount of asphalt shall be continuously injected into the dryer-drum mixer with the aggregate in the amount required by the job-mix formula, using the injection and control equipment previously specified. The temperature of the asphalt shall not exceed 163 degrees C (325 degrees F) at any time. The temperature of the bituminous mixture as discharged from the dryer-drum mixer shall not exceed 149 degrees C (300 degrees F). The speed of rotation of the drum, the temperature within the drum and time the mixture is within the drum shall be controlled so as to produce a uniform bituminous mixture without segregation and with all aggregate particles thoroughly coated and conforming to all requirements of these specifications. All overheated and carbonized mixtures shall be rejected. Particular care shall be taken when commencing operations each day to reject any bituminous mixture that does not meet all requirements of these specifications.

## 3.4.2.3 Moisture test

Absorbed moisture in the aggregate shall be reduced to such a quantity that there is no objectionable segregation of asphalt resulting from escaping water vapor in the prepared mixture. A maximum of 0.5 percent moisture based on weight of the mixture, will be allowed in the mixture when sampled behind the paver and tested in accordance with ASTM D 1461.

### 3.5 TRANSPORTATION OF BITUMINOUS MIXTURE

The bituminous mixture shall be transported from the mixing plant to the site in trucks having tight, clean, smooth beds coated with a minimum amount of a concentrated solution of hydrated lime and water to prevent adhesion of the mixture to the truck beds. Each load of mixture shall be covered with canvas, or other suitable material of ample size to protect the mixture from the weather and to prevent loss of heat. Deliveries shall be scheduled so that spreading and rolling of all mixture prepared for one day's run can be completed during daylight unless approved adequate artificial lighting is provided. The mixture shall be delivered in such manner that the temperature at the time of dumping into the spreader will be not less than hereinafter specified. Loads that have crusts of cold, unworkable material or have become wet by rain will be rejected. Hauling over freshly placed material will not be permitted.

## 3.6 PLACING

Intermediate course, or any layer of surface source shall not be left uncovered by the subsequent course for more than 5 days, weather permitting. Material trucks hauling materials other than asphaltic concrete or tack coat shall not travel on previously constructed layers of asphaltic concrete until the final surface course is constructed.

## 3.6.1 Surface Preparation of Underlying Course

Prior to placing of the intermediate or surface course, the underlying course shall be cleared of all foreign or objectionable matter with power blowers, power brooms, or hand brooms. A tack coat shall be applied between the intermediate and surface course mixture. The tack coat between layers of recently constructed inter-mediate course, or layers of recently constructed surface course, may have the application rate reduced when specifically approved if the surface of the previously placed layer as approved is entirely free of dust, dirt or other foreign matter which might reduce the bond between the layers of the intermediate or surface course. Tack coat shall not be completely omitted.

## 3.6.2 Offsetting Joints in Intermediate and Surface Courses

The surface course shall be placed so that longitudinal joints of the surface course will not coincide with joints in the intermediate course by approximately 230 mm (9 inches). Care shall be taken when possible to offset longitudinal joints in a manner that the final surface course joint is in the center of the pavement or on a lane line. Transverse joints in the surface course shall be offset by at least two feet from transverse joints in the intermediate course.

## 3.6.3 General Requirements for Use of Mechanical Spreader

The range of temperatures of the mixture, when dumped into the mechanical spreader shall be as determined by the Contractor. Asphalt mixtures having temperatures less than 113 degrees C (235 degrees F) when dumped into a mechanical spreader will be rejected. The mechanical spreader shall be so adjusted and its speed so regulated that the surface of the course being placed will be smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface will conform with the cross section, grade, and contour shown on the drawings. Unless otherwise directed, placing shall begin along the centerline of areas paved on a crowned section or on the high side of areas with a one-way slope, and shall be in the direction of the major traffic flow. The mixture shall be placed in consecutive adjacent strips having a minimum width of 3.05 meters (10 feet), except when edge lanes require strips less than 3.05 meters (10 feet) to complete an area. Each strip placed before a succeeding strip shall be of such length that sufficient heat will be retained to make the strip readily compactible so that a joint can be obtained conforming to the requirements for texture, density, and smoothness specified in the paragraph: JOINTS. The length of any strip to be laid prior to the succeeding strip shall be as directed and may be decreased or increased as dictated by changes in climatic conditions. Longitudinal joints and edges shall be constructed to true line markings. The Contractor shall establish lines parallel to the centerline of the area to be paved and shall place string lines coinciding with established lines for the spreading machine to follow. Number and location of lines shall be as directed. Placing of the mixture shall be as nearly continuous as possible, and the speed of placing shall be adjusted, as directed, to permit proper rolling.

## 3.6.3.1 Special Procedures to Prevent Segregation

The wings of the spreader hopper shall not be emptied (flipped) between truck loads. The screed auger shall be operated approximately three-fourths (3/4) full and the hopper conveyor shall not be allowed to run out of material.

## 3.6.4 Special Requirements for Placing Strips Succeeding Initial Strips

In placing each succeeding strip after the initial strip has been spread and compacted as specified hereafter, the screed end gate of the mechanical spreader shall overlap the previously placed strip slightly and shall be 1.25 times thicker than the existing compacted strip in order to produce a smooth compacted joint with the specified density. Mixture placed on the edge of the previously placed strip by the mechanical spreader shall be pushed back (tucked) to the edge of the strip being placed by use of a lute (rake). The pushed back material shall form a ridge on the uncompacted strip along the edge of the previously placed strip. The height of the ridge above the uncompacted strip should be approximately equal to the thickness being allowed for roll down during compaction. Procedures similar to these outlined above shall be used to facilitate getting a smooth joint with density. When the quantity of mixture on the previously placed strip plus uncompacted material in the strip being placed exceeds that required to produce a smooth, dense joint, the excess mixture shall be removed and wasted. Excess material shall not be spread over the uncompacted mat.

## 3.6.5 Shoveling, Raking, and Tamping After Machine Spreading

A sufficient number of experienced shovelers and rakers shall follow the spreading machine, adding hot mixture and raking the mixtures as required to produce a course that, when completed, will conform to all requirements specified herein. Broadcasting or fanning of mixture over areas being compacted will not be permitted. When segregation occurs in the mixture during placing, the spreading operation shall be suspended until the cause is determined and corrected. Irregularities in alignment of the course left by the mechanical spreader shall be corrected by trimming directly behind the machine. Immediately after trimming, the edges of the course shall be thoroughly compacted by tamping laterally with a lute. Distortion of the course during tamping will not be permitted.

## 3.6.6 Hand Spreading in Lieu of Machine Spreading

In areas where the use of machine spreading is impractical, the mixture shall be spread uniformly with hot shovels and hot rakes in a loose layer of a thickness that, when compacted, will conform to the required grade and thickness. During hand spreading, each shovelful of mixture shall be carefully placed by turning the shovel over in a manner that will prevent segregation. In no case shall the mixture be placed by throwing or broadcasting from a shovel. The loads shall not be dumped faster than can be properly handled by the shovelers and rakers.

#### 3.7 COMPACTION OF MIXTURE

#### 3.7.1 General

Compaction of the mixture shall be accomplished using a minimum of 2 steel-wheel rollers and a pneumatic-tired roller specified above. Rolling

shall begin as soon after placing as mixture will bear roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted. After initial rolling, preliminary tests of crown, grade, and smoothness shall be made by the Contractor under supervision of the Contracting Officer. Before rolling is continued, deficiencies shall be corrected so that finished course will conform to requirements for grade and smoothness specified herein. Further smoothness checks shall be made by the Contractor as directed by the Contracting Officer. After preliminary smoothness tests, rolling shall be continued until density is obtained in all portions of each course of not less than 95 percent of density of laboratory compacted Marshall specimens taken behind the paver.

## 3.7.2 Density Tests

Density of the compacted mixture of the surface or intermediate course shall be determined by tests made on specimens taken from the compacted course in accordance with the requirements of paragraph: SAMPLING PAVEMENTS. Specimens shall be tested in accordance with the requirements of ASTM D 2726-90.

## 3.7.3 Operation of Rollers, Tampers and Vibro Plate Compactors

## 3.7.3.1 Roller Speed

The speed of rollers shall be slow enough at all times to avoid displacement of the hot mixture. Displacement of the mixture resulting from reversing the direction of the roller or from any other cause shall be corrected at once by use of rakes, and fresh mixture shall be applied or removed when necessary. Alternate passes of the roller shall be varied slightly in length. During rolling, the wheels of steel-wheel rollers and plates of vibro plate compactors shall be moistened to prevent adhesion of the mixture to the wheels or plates, but excess water will not be permitted. Tires of heavy pneumatic roller shall be moistened with soapy water when required to prevent mixture from sticking to tires during rolling. Rollers shall not be permitted to stand on finished courses until the courses have thoroughly cooled. The minimum number of rollers shall be adequate to obtain the specified density. Places inaccessible to rollers shall be thoroughly compacted with hot hand-tampers or vibro plate compactors.

## 3.7.3.2 Intermediate Rolling

Unless otherwise directed by Contracting Officer a pneumatic-tired roller shall be used as an intermediate roller. Longitudinal joints shall be pinched to ensure compaction with the pneumatic-tired roller. The roller shall make at least one complete pass (forward and backward) operated on the hot lane as the intermediate roller. The roller shall be operated with its outside tire as close as possible to the previously placed lane.

## 3.7.4 Correcting Deficient Areas

Mixtures that become contaminated or are defective shall be removed. Skin patching of an area that has been rolled will not be permitted. Holes the full thickness of the course shall be cut so that the sides are perpendicular and parallel to the direction of traffic and the edges are vertical. Edges shall be sprayed with bituminous materials conforming to the requirements of SECTION: BITUMINOUS TACK COAT. Sufficient fresh paving mixture shall be placed in the holes so that finished surface will

conform to the grade and smoothness requirements. The paving mixture shall be compacted to the density specified herein.

## 3.8 JOINTS

#### 3.8.1 General

Joints between old and new pavements or between successive day's work, or joints that have become cold because of delay, shall be tacked and shall be made carefully to insure continuous bond between old and new sections of the course. All joints shall have the same texture, density, and smoothness as other sections of the course. The tack shall be overlapped onto the previous pavement 25 mm (1 inch) or 50 mm (2 inches). Contact surfaces of previously constructed pavements, curbs, gutters, manholes, etc., shall be tacked. If these surfaces have become coated with dust, sand, or other objectionable material, they shall be cleaned by brushing or cut back with an approved power saw, as directed. The surface against which new material is to be placed shall be sprayed with a thin, uniform coat of bituminous material conforming to the requirements of SECTION:
BITUMINOUS TACK COAT. The material shall be applied far enough in advance of placement of the fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

#### 3.8.2 Transverse Joints

The roller shall pass over the unprotected end of freshly placed mixture only when placing of the course is discontinued or when delivery of mixture is interrupted to the extent that unrolled material may become cold. In all cases, the edge of the previously placed course shall be cut back to expose an even, vertical surface the full thickness of the course. In continuing placement of strip, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling which conforms to the required density and smoothness specified herein. When required, the fresh mixture shall be raked against the joints, thoroughly tamped with hot tampers, smoothed with hot irons and rolled.

## 3.8.3 Longitudinal Joints

Longitudinal joints in surface course or intermediate course shall be offset as stated in specification paragraph: Offsetting Joints in Intermediate and Surface Courses. Procedures outlined in specification paragraph: Special Requirements for Placing Strips Succeeding Initial Strips shall be followed when making longitudinal joints. Edges of previously placed strips that have cooled or are irregular, honeycombed, poorly compacted, damaged, or otherwise defective, and unsatisfactory sections of the joint shall be cut back to expose a clean, sound surface for the full thickness of the course as directed. When required, fresh mixtures shall be raked against the joint, thoroughly tamped with hot tampers, smoothed with hot irons and rolled.

## 3.9 EDGES OF PAVEMENT

Edges of pavement adjacent to the shoulders shall be trimmed neatly to line. Shoulder material not less than 0.3 meters (1 foot) wide shall be placed against and to the full height of the pavement surface as soon as practicable after final rolling has been completed and the pavement has sufficiently hardened.

#### 3.10 PROTECTION OF PAVEMENT

After final rolling of the pavement, no vehicular traffic of any kind shall be permitted until the pavement has cooled and hardened or for at least 6 hours.

#### 3.11 SURFACE REQUIREMENTS

Finished surface of bituminous courses, when tested as specified below shall conform to gradeline and elevations shown and to surface-smoothness requirements specified.

#### 3.11.1 Plan Grade

The grade of the completed surface shall not deviate more than 1.5 mm (0.05 foot) from the plan grade.

#### 3.11.2 Bituminous Intermediate Course

Upon completion of final rolling the surface of the intermediate course, if any, shall be smooth and true to grade and cross section. When a 12-foot straightedge is laid on the surface parallel with the centerline of the paved area or transverse from crown to pavement edge, the surface shall not vary more than 1/4 inch from the straightedge. Surface irregularities exceeding these requirements shall be corrected as directed. Testing for plan-grade conformance and surface smoothness shall be performed by the Contracting Officer immediately after rolling is completed. Tests shall be made at intervals as directed.

#### 3.11.3 Bituminous Surface Course

The surface course, upon completion of final rolling, shall be smooth and true to grade and cross section. When a 3.66 meters (12-foot) straightedge is laid on the surface parallel with the centerline, the surface shall not vary more than 3.2 mm (1/8 inch) from the straightedge. When the 3.66 meters (12-foot) straightedge is laid on the surface transverse to the centerline between the crown and edge of payment, the surface shall not vary more than 6.4 mm (1/4 inch) from the straightedge. Low or defective areas shall be immediately corrected by cutting out the faulty areas and replacing with fresh, hot mixture, and compacting the area to conform to the remainder of the pavement. Testing for plan-grade conformance and surface smoothness shall be performed by the Contractor in the presence of a representative of the Contracting Officer immediately after rolling is completed. Tests shall be made at intervals as directed.

## 3.11.4 Equipment

The Contractor shall furnish and maintain at the site, in good condition, one straightedge for each bituminous paver, for use of the Contracting Officer in testing the finished surface. Straightedges shall be aluminum or other approved lightweight metal and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on the pavement. Where devices other than straightedges are approved for surface smoothness determination, the Contractor shall furnish and maintain in good condition at the site, one such device for each bituminous paver.

## 3.12 SAMPLING PAVEMENTS

Samples of finished pavement, including samples that span the longitudinal joints, shall be obtained by the Contractor. A minimum of one test (three cores or sawed samples) shall be taken for each tonnage lot represented by a Marshall test. The three cores or sawed samples shall be taken at locations throughout the tonnage lot. The locations shall not be previously marked. Sample shall be taken at locations determined by the Contracting Officer. Additional samples shall be taken and tested at the start of the paving operations when directed. One-half of the samples shall be cut from longitudinal joints. The Contracting Officer may require additional testing at no additional cost to the Government. The Government may also perform verification tests as considered necessary. Cores shall be at least 101.6 mm (4 inches) in diameter and sawed samples at least 127.0 mm (5 inches) on each side. The samples shall be tested by the Contractor to determine conformance to density, thickness and, if directed, other specified requirements. All quality control sampling and testing shall be the responsibility of the Contractor in accordance with paragraph SECTION: CONTRACTOR QUALITY CONTROL, specification paragraph: QUALITY CONTROL and as specified herein. Samples of each day's production shall be taken by noon of the following day and results of tests reported to the Contracting Officer by the end of that day. The Contractor shall furnish a power saw or core drill and labor for cutting samples and shall immediately replace the pavement. Sample holes shall have all surfaces tacked. Hot-mix bituminous mix shall be compacted in the sample hole to the satisfaction of the Contracting Officer. The finished surface of the repaired sample hole shall be sealed by mopping with tack coat.

## 3.13 INSPECTION OF PLANT AND EQUIPMENT

The Contracting Officer shall have access at all times to all parts of the paving plant for checking adequacy of equipment in use, for inspecting operation of plant, verifying weights, proportions, and character of materials, and for checking temperatures maintained in preparation of mixtures. Checks so made shall not relieve the Contractor from performing all work as specified.

-- End of Section --

## SECTION 02712

## LIME-MODIFIED SUBGRADE 12/97

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 25	(1996a) Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
ASTM C 50	(1994) Sampling, Inspection, Packing, and Marking of Lime and Limestone Products
ASTM C 110	(1995b) Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place By Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing

#### Purposes

## 1.2 DEFINITIONS

#### 1.2.1 Lime-Modified Subgrade

Lime-Modified Subgrade, as used in this specification, is a mixture of lime and satisfactory in-place or borrow material uniformly blended, wetted, and thoroughly compacted to produce a pavement course which meets the criteria set forth in the plans and this specification.

## 1.2.2 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as percent laboratory maximum density.

#### 1.3 JOB DESCRIPTION

The work specified consists of the construction of a lime-modified subgrade course. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes, and typical sections shown in the drawings. Sources of materials shall be selected well in advance of the time when materials will be required in the work.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment, Machines, and Tools; G-RE.

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-06 Test Reports

Field Density;

Copies of field control test results within  $24\ \text{hours}$  after the tests are performed.

SD-07 Certificates

Lime; G-RE

Source; G-RE

Source from which lime is to be obtained with certified mill results showing the lime meets all the requirements as outlined in subparagraph Lime Sources. Lime shall be in accordance with paragraph MATERIALS. Certified copies of test results of materials and sources submitted not less than 30 days before material is required for the work.

#### SAMPLING AND TESTING; G-RE

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. Work requiring testing will not be permitted until the facilities have been inspected and approved.

## 1.5 EQUIPMENT, MACHINES, AND TOOLS

## 1.5.1 General Requisites

Equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in satisfactory working condition at all times. Other compacting equipment may be used in lieu of that specified, where it can be demonstrated that the results are equivalent. Protective equipment, apparel, and barriers shall be provided to protect the eyes, respiratory system, and the skin of workers exposed to contact with lime dust or slurry.

## 1.5.2 Puverizing Equipment

The pulverizing equipment shall be self-propelled, 4 wheel drive and operated by a single operator. It shall be capable of pulverizing in a single pass the existing full depth and 2.44 meters wide. The rotor shall be capable of up or down cutting. It shall be equipped with tap-in, knock-out, bullet-type teeth, all of which are identical.

#### 1.5.3 Steel-Wheeled Rollers

Steel-wheeled rollers shall be the self-propelled type with a total weight of not less than 9 metric tons, and a minimum weight of 135 kilograms per millimeter width of rear wheel. Wheels of the rollers shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.

## 1.5.4 Pneumatic-Tired Rollers

Pneumatic-tired rollers shall have 4 or more tires, each loaded to a minimum of 13.6 metric tons and inflated to a minimum pressure of 1.035 MPa. The loading shall be equally distributed to all wheels, and the tires shall be uniformly inflated. Towing equipment shall also be pneumatic-tired.

## 1.5.5 Mechanical Spreader

Mechanical spreader shall be self-propelled or attached to a propelling unit capable of moving the spreader and material truck. The device shall be steerable and shall have variable speeds forward and reverse. The spreader and propelling unit shall be carried on tracks, rubber tires, or drum-type steel rollers that will not disturb the underlying material. The spreader shall contain a hopper, an adjustable screed, and outboard bumper rolls; and shall be designed to have a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material without segregation across the full width of the lane to a uniform thickness and to a uniform loose density so that when compacted, the layer or layers shall conform to thickness and grade requirements indicated. The Contracting Officer may require a demonstration of the spreader prior to approving use in performance of the work.

## 1.5.6 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors, or other approved equipment designed to apply controlled quantities of water uniformly over variable widths of surface.

#### 1.5.7 Tampers

Tampers shall be of an approved mechanical type, operated by either pneumatic pressure or internal combustion, and shall have sufficient weight and striking power to produce the compaction required.

#### 1.6 WEATHER LIMITATIONS

Work on the base course shall not be performed during freezing temperatures. When the temperature is below 5 degrees C, the completed base course shall be protected against freezing by a sufficient covering of straw, or by other approved methods, until the course has dried out. Any areas of completed base course that are damaged by freezing, rainfall, or other weather conditions shall be brought to a satisfactory condition without additional cost to the Government. Lime shall not be applied when the atmospheric temperature is less than 5 degrees C. No lime shall be applied to soils that are frozen or contain frost, or when the underlying material is frozen. If the temperature falls below 2 degrees C, completed lime-treated areas shall be protected against any detrimental effects of freezing.

#### PART 2 PRODUCTS

#### 2.1 MATERIALS

### 2.1.1 Lime

Lime shall be a hydrated or granular quicklime conforming to the following requirements, however granular quicklime shall be delivered to the jobsite as a slurry.

## 2.1.1.1 Hydrated Lime

Hydrated lime for this purpose shall be any hydrated lime product consisting of hydrated lime and insoluble inert material and conforming to the following as to chemical composition and residue: 90% minimum available Lime Index as Calcium Hydroxide, CA(OH)2; 1% maximum residue retained on a 600 um sieve; and 2% maximum residue retained on a 75 um sieve.

## 2.1.1.2 Granular Quicklime

Granular quicklime is a calcined material, the major part of which is calcium oxide or calcium oxide in natural association with a lesser amount of magnesium oxide capable of slaking with water. This specification applies specifically to limes made from calcium-type limestones. When tested under the appropriate methods of test, the lime shall conform to the following requirements: Not less than 90% minimum available lime index as Calcium Oxide (CaO); Fineness (Dry Sieve) - 5% maximum retained on a 16 mm sieve, 75% minimum retained on a 425 um sieve, 96% minimum retained on a 75 um sieve; and Residue after slaking (wet sieve) - 5% maximum retained on a 850 um sieve.

#### 2.1.2 Material to be Stabilized

Material to be modified shall consist of satisfactory material. Satisfactory material shall comprise any materials classified by ASTM D 2487 as GP, GM, SC, SW, SM, ML, CL or CH. Unsatisfactory materials shall comprise any materials classified by ASTM D 2487 as Pt, OH, OL or MH.

#### 2.1.3 Water

Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, and other substances deleterious to the lime or soil-lime mixture, and shall be subject to approval.

## PART 3 EXECUTION

#### 3.1 LIME STABILIZATION MIXTURE

The Contractor shall construct a working platform for new pavement construction by lime-modifying the subgrade soil. To accomplish this, the Contractor shall incorporate a minimum of 5 percent hydrated lime by weight (based on oven-dry weight of the soil) or a minimum 3.8 percent granular quicklime by weight (based on oven-dry weight of the soil) to the minimum depth shown on the drawings below top of subgrade. The material to be stabilized shall be thoroughly pulverized and, when lime is applied in the dry state, the mix shall be thoroughly blended at a moisture content below optimum. After blending, water shall be blended into the dry mix in amounts necessary to bring the moisture content to optimum. Field moisture content shall be controlled within plus or minus 2 percent of optimum. When the modified subgrade is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweeper or power brooms except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire construction period to prevent water from collecting or standing on the area to be stabilized or on pulverized, mixed, or partially mixed material. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

## 3.2 PREPARATION OF AREA TO BE MODIFIED

After pavement and subgrade excavation, the area to be modified shall be cleaned of debris. The area will be inspected for adequate compaction and shall be capable of withstanding, without displacement, the compaction specified for the soil-lime mixture. Debris and removed unsatisfactory in-place material shall be disposed of as specified.

## 3.2.1 In-Place Material to be Modified

The entire area shall be graded to conform to the lines, grades, and cross sections shown in the plans prior to being processed. Soft, yielding areas and ruts or other irregularities in the surface shall be corrected. The material in the affected areas shall be loosened and unsatisfactory material removed. The area shall then be shaped to line, grade, and cross section, and shall be compacted to the specified density.

## 3.2.2 Grade Control

Underlying material shall be excavated to sufficient depth for the required stabilized-course thickness so that the finished stabilized course with the subsequent surface course will meet the fixed grade. Finished and completed stabilized area shall conform to the lines, grades, cross section, and dimensions indicated.

#### 3.3 INSTALLATION

## 3.3.1 Mixed In-Place Method

## 3.3.1.1 Scarifying and Pulverizing of Soil

Prior to application of lime, the soil shall be scarified and pulverized to a sufficient width and depth to obtain a uniform mixture of soil, lime and water and to form a compacted lime-treated course conforming to the cross section indicated. Scarification shall be controlled so that the layer beneath the layer to be treated is not disturbed. Depth of pulverizing shall not exceed the depth of scarification.

## 3.3.1.2 Application of Lime

Pulverized material shall be shaped to approximately the cross section indicated. Lime shall be applied so that when uniformly mixed with the soil, the specified lime content is obtained, and a sufficient quantity of lime-treated soil is produced to construct a compacted lime-treated course conforming to the lines, grades, and cross section indicated. Mechanical spreaders shall be used in applying bulk lime. Distributors shall be used in applying slurry. If lime is spread by hand, the bags shall be spotted accurately on the area being stabilized so that when the bags are opened the lime will be dumped and spread uniformly on the area being processed. No equipment except that used in spreading and mixing shall pass over the freshly applied lime.

## 3.3.1.3 Initial Mixing

Immediately after the lime has been distributed, the lime and soil shall be mixed. Initial mixing shall be sufficient to alleviate any dusting or wetting of the lime that might occur in the event of wind or rainstorms. This may be accomplished several days in advance of the final application and mixing.

## 3.3.1.4 Water Application and Moist Mixing

Moisture content of the mixture shall be determined in preparation for final mixing. Moisture in the mixture following final mixing shall not be less than the water content determined to be optimum based on dry weight of soil and shall not exceed the optimum water content by more than 2 percentage points. Water may be added in increments as large as the equipment will permit; however, such increment of water shall be partially incorporated in the mix to avoid concentration of water near the surface. After the last increment of water has been added, mixing shall be continued until the water is uniformly distributed throughout the full depth of the mixture, including satisfactory moisture distribution along the edges of the section.

## 3.3.2 Edges of Modified Course

Approved material shall be placed along the edges of the stabilized course

in a quantity that will compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple-layer course, allowing at least a 300 mm width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer of the stabilized course.

## 3.3.3 Layer Thickness

After final mixing the material shall be compacted in lift thicknesses no more than 200 mm or less than 75 mm If the minimum density cannot be obtained throughout the entire lift, the Contractor will be required to construct the layer in two or more lifts.

## 3.3.4 Compaction

Before compaction operations are started and as a continuation of the mixing operation, the mixture shall be thoroughly loosened and pulverized to the full depth. Compaction shall be started immediately after mixing is completed. During final compaction, the surface shall be moistened, if necessary, and shaped to the required lines, grades, and cross section. The density of the compacted soil-lime mixture for the full thickness of the modification shall be at least the maximum laboratory density obtained by the test procedure presented in ASTM D 1557. The maximum laboratory density shall be determined after the lime and water have been mixed into the subgrade and cured for at least 24 hours. The subgrade density of the compacted mixture shall be at least 90 percent of laboratory maximum density for rigid pavement and 95 percent of laboratory maximum density for flexible pavement. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. At all times, the speed of the roller shall not cause displacement of the mixture to occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers, and shall be shaped and finished by hand methods.

## 3.3.5 Finishing

The surface of the top layer shall be finished to the grade and cross section shown. The surface shall be of uniform texture. Light blading during rolling may be necessary for the finished surface to conform to the lines, grades, and cross sections. If the surface for any reason becomes rough, corrugated, uneven in texture, or traffic-marked prior to completion, the unsatisfactory portions shall be scarified, reworked, relaid, or replaced as directed. If any portion of the course, when laid, becomes watersoaked for any reason, that portion shall be removed immediately, and the mix placed in a windrow and aerated until a moisture content within the limits specified is obtained; and then spread, shaped, and rolled as specified above.

## 3.3.6 Construction Joints

At the end of each phase of construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face free of loose or shattered material. Material along construction joints not properly compacted shall be removed and replaced with soil-lime mixture that is mixed, moistened, and compacted as specified.

## 3.3.7 Curing and Protection

Immediately after the soil-lime area has been finished as specified above, the surface shall be protected against rapid drying for 7 days by moist curing. The modified area shall be protected from freezing during the curing period or until hardened, whichever is longer.

## 3.3.7.1 Moist Curing

The area shall be moistened by sprinkling and shall be kept moist for the 7-day curing period.

#### 3.4 SAMPLING AND TESTING

## 3.4.1 General Requirements

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. Work requiring testing will not be permitted until the facilities have been inspected and approved. The first inspection will be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed in sufficient numbers and at the locations and times directed to ensure that materials and compaction meet specified requirements. Certified copies of the test results shall be furnished to the Contracting Officer.

#### 3.4.2 Results

Results shall verify that the material complies with the specification. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced.

#### 3.4.3 Sampling

Samples of lime shall be taken in accordance with ASTM C 50. During actual construction, no substitution shall be made in the materials which were used in the verification tests without additional verification testing similar to the original verification tests.

## 3.4.4 Sieve Analysis

Before starting work, one sample of material to be stabilized shall be tested in accordance with ASTM C 136 and ASTM D 422 on sieves conforming to ASTM E 11. After the initial test, a minimum of one analysis shall be performed for each 1000 metric tons of material placed, with a minimum of three analyses for each day's run until the course is completed.

## 3.4.5 Liquid Limit and Plasticity Index

One liquid limit and plasticity index shall be performed for each sieve analysis. Liquid limit and plasticity index shall be in accordance with ASTM D 4318.

## 3.4.6 Lime Source

The source from which the lime is to be obtained shall be designated by the

Contractor. The Contractor shall furnish certified mill results at least 30 days prior to the use of the lime. The certified mill results shall show that the lime meets all requirements specified herein. Lime shall be tested for the specified chemical and physical requirements in accordance with ASTM C 25 and ASTM C 110, respectively.

## 3.4.7 Density-Moisture Determinations

Tests for determination of maximum density and optimum moisture shall be the responsibility of the Contractor in accordance with the requirements of ASTM D 1557. Samples shall be representative of the materials to be placed. An optimum moisture-density curve shall be obtained for each principal type of materials or combination of materials encountered or utilized. Results of these tests shall be the basis of control for compaction. The density-moisture determination shall include Atterberg limits, grain size determinations and specific gravity.

## 3.4.8 Verification Tests

During construction of the lime-modified subgrade, the Contractor shall verify the application rate and depth of stabilization.

## 3.5 FIELD QUALITY CONTROL

Tests shall provide a moisture-density relationship for the lime-soil mixture. Results of field quality control testing shall verify that materials comply with this specification. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or repaired, as directed by the Contracting Officer, at no additional cost to the Government.

### 3.5.1 Thickness Control

Completed thicknesses of the modified subgrade shall be within 13 mm of the thickness indicated on the drawings. Where the measured thickness of the modified subgrade is more than 13 mm deficient, such areas shall be corrected by scarifying, adding mixture of proper gradation, reblading, and recompacting as directed. Where the measured thickness of the stabilized course is more than 13 mm thicker than indicated, it shall be considered as conforming to the specified thickness requirement. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 6 mm of the thickness indicated. Thickness of the stabilized course shall be measured at intervals which ensure one measurement for each 400 square meters of stabilized course. Measurements shall be made in 75 mm diameter test holes penetrating the stabilized course.

## 3.5.2 Field Density

Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 at least

once per lift for each 840 square meter of stabilized material. Calibration curves and calibration tests results shall be furnished to the Contracting Officer within 24 hours of conclusion of the tests. At least one field density test shall be performed for each 250 square meters of each layer of base material.

#### 3.6 TRAFFIC

Completed portions of the lime-treated soil area may be opened immediately to light traffic provided the curing is not impaired. After the curing period has elapsed, completed areas may be opened to all traffic, provided the stabilized course has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic. Heavy equipment shall not be permitted on the area during the curing period. Lime and water may be hauled over the completed area with pneumatic-tired equipment if approved. Finished portions of lime-stabilized soil that are traveled on by equipment used in constructing an adjoining section shall be protected in a manner to prevent equipment from marring or damaging completed work.

#### 3.7 MAINTENANCE

The modified area shall be maintained in a satisfactory condition until the completed work is accepted. Maintenance shall include immediate repairs of any defects, as determined by the Contracting Officer, and shall be repeated as often as necessary to keep the area intact. Defects shall be corrected as stated herein.

#### 3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Removed in-place materials that are unsuitable for stabilization, material that is removed for the required correction of defective areas, waste material, and debris shall be disposed of as directed by the Contracting Officer.

-- End of Section --

# SECTION 02714

# RAPID DRAINAGE LAYER 12/97

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 88	(1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock In Place by Nuclear Methods (Shallow Depth)
ASTM D 4791	(1995) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregates
ASTM E 548	(1994) General Criteria Used for Evaluating Laboratory Competence

## 1.2 SYSTEM DESCRIPTION

The Contractor shall build a drainage layer (also referred to as Rapid Drainage Material (RDM)) under the streets pavements as indicated and in

accordance with the following subparagraphs:

## 1.2.1 Aggregate Drainage Layer

A drainage layer consisting of rapid draining materials (RDM) meeting the gradations of Table I.

#### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Sampling and Testing; .

Copies of field test results within 24 hours of completion of tests.

Approval of Materials; G-RE.

Material sources and material test results prior to field use.

Evaluation; G-RE.

Test section construction report.

### 1.4 FIELD COMPACTION

Field compaction requirements shall be based on the results of a test section constructed by the Contractor, using the materials, methods, and equipment proposed for use in the work. The test section shall meet the requirements of paragraph TEST SECTION.

# 1.5 EQUIPMENT

# 1.5.1 General Requirements

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times.

## 1.5.2 Placement Equipment

An asphalt paving machine shall be used to place drainage layer material. Alternate methods may be used if it can be demonstrated in the test section that these methods obtain the specified results.

# 1.5.3 Compaction Equipment

A dual or single smooth drum roller which provides a maximum compactive effort without crushing the drainage layer aggregate shall be used to compact drainage layer material.

# 1.6 WEATHER LIMITATION

Drainage layer material shall be placed when the atmospheric temperature is

above 2 degrees C. Areas of completed drainage layer or underlying courses that are damaged by freezing, rainfall, or other weather conditions or by contamination from sediments, dust, dirt, or foreign material shall be corrected by the Contractor to meet specified requirements.

## 1.7 SAMPLING AND TESTING

## 1.7.1 General Requirements

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor subject to approval. If the Contractor elects to establish testing facilities of his own, approval of such facilities shall be based on compliance with ASTM E 548, and no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved. The first inspection of the facilities will be at the expense of the Government and any subsequent inspections required because of failure of the first inspection shall be at the expense of the Contractor. Such costs will be deducted from the total amount due the Contractor. Drainage layer materials shall be tested to establish compliance with the specified requirements.

## 1.7.2 Sampling

Aggregate samples shall be taken in accordance with ASTM D 75.

#### 1.7.3 Test Methods

## 1.7.3.1 Sieve Analyses

Sieve analyses shall be made in accordance with ASTM C 117 and ASTM C 136.

# 1.7.3.2 Density Tests

Field density tests shall be made in accordance with ASTM D 2922. When using this method, ASTM D 3017 shall be used to determine the moisture content of the aggregate drainage layer material. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph "Calibration" of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals as directed by the Contracting Officer.

## 1.7.3.3 Soundness Test

Soundness tests shall be made in accordance with ASTM C 88.

## 1.7.3.4 Los Angeles Abrasion Test

Los Angeles abrasion tests shall be made in accordance with ASTM C 131.

# 1.7.3.5 Flat or Elongated Particles Tests

Flat and/or elongated particles tests shall be made in accordance with ASTM D 4791.

## 1.7.3.6 Fractured Faces Tests

When aggregates are supplied from crushed gravel, approved test methods shall be used to assure the aggregate meets the requirements for fractured faces in paragraph AGGREGATES.

# 1.7.4 Testing Frequency

#### 1.7.4.1 Aggregate Drainage Layer

Sieve analyses, field density, and moisture content tests shall be performed at a rate of at least one test for every 1000 square meters of completed area and not less than one test for each day's production. Soundness tests and Los Angeles abrasion tests shall be performed at the rate of one test for every 10 sieve analysis tests.

# 1.7.5 Approval of Materials

# 1.7.5.1 Aggregate

The aggregate source shall be selected at least 60 days prior to field use in the test section. Tentative approval of the source will be based on certified test results to verify that materials proposed for use meet the contract requirements. Final approval of both the source and the material will be based on test section performance and tests for gradation, soundness, Los Angeles abrasion, flat and/or elongated particles tests and fractured faces tests. For aggregate drainage layer materials, these tests shall be performed on samples taken from the completed and compacted drainage layer course within the test section.

# PART 2 PRODUCTS

### 2.1 AGGREGATES

Aggregates shall consist of clean, sound, hard, durable, angular particles of crushed stone, which meet the specification requirements. The aggregates shall be free of silt and clay as defined by ASTM D 2487, vegetable matter, and other objectionable materials or coatings.

# 2.1.1 Aggregate Quality

The aggregate shall have a soundness loss not greater than 24 percent weighted averaged at five cycles when tested in magnesium sulfate in accordance with ASTM C 88. The aggregate shall have a percentage of loss on abrasion not to exceed 40 after 500 revolutions as determined by ASTM  ${\tt C}$ 131. The percentage of flat and/or elongated particles shall be determined by ASTM D 4791 with the following modifications. The aggregates shall be separated into 2 size fractions. Particles greater than 12.5 mm sieve and particles passing the 12.5 mm sieve and retained on the 4.75 mm sieve. The percentage of flat and/or elongated particles in either fraction shall not exceed 20. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. When the aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements. When the aggregate is supplied from crushed gravel it shall be manufactured from gravel particles, 90 percent of which by weight are retained on the maximum-size sieve listed in TABLE I. In the portion retained on each sieve specified, the crushed gravel shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest

midsectional area of the face. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as 2 fractured faces.

### 2.1.2 Gradation Requirements

Drainage layer aggregates shall be well graded within the limits specified in TABLE I.

TABLE I. GRADATION OF DRAINAGE LAYER MATERIAL

Percentage by Weight Passing Square-Mesh Sieve

Si Designat	ieve tion	Rapid Draining Material (RDM)
37.50	mm	100
25.00	mm	70-100
19.00	mm	55-80
12.50	mm	40-60
9.50	mm	25-50
4.75	mm	8-30
2.36	mm	0-20
1.18	mm	0-5

NOTE 1: The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves may require appropriate correction by the Contracting Officer when aggregates of varying specific gravities are used.

# PART 3 EXECUTION

# 3.1 TEST SECTION

# 3.1.1 Data

A test section shall be constructed to evaluate the ability to carry traffic and the constructability of the drainage layer including required mixing, placement, and compaction procedures. Test section data will be used by the Contracting Officer to determine the required number of passes and the field dry density requirements for full scale production.

## 3.1.2 Scheduling

The test section shall be constructed a minimum of 30 days prior to the start of full scale production to provide sufficient time for an evaluation of the proposed materials, equipment and procedures including Government QA testing.

## 3.1.3 Location and Size

The test section shall be placed within the limits of the RDM construction area at a location approved by the Contracting Officer. The underlying courses and subgrade preparation, required for the pavement section, shall be completed, inspected and approved in the test section prior to constructing the drainage layer. The test section shall be a minimum of 30 m long and one full paving lane wide.

#### 3.1.4 Initial Testing

Certified test results, to verify that the materials proposed for use in the test section meet the contract requirements, shall be provided by the Contractor and approved by the Contracting Officer prior to the start of the test section.

# 3.1.5 Mixing, Placement, and Compaction

Mixing, placement, and compaction shall be accomplished using equipment meeting the requirements of paragraph EQUIPMENT. Compaction equipment speed shall be no greater than 2.4 km/hour.

#### 3.1.6 Procedure

## 3.1.6.1 Aggregate Drainage Layer Tests

The test section shall be constructed with aggregate in a moist state so as to establish a correlation between number of roller passes and dry density achievable during field production. Density and moisture content tests shall be conducted at the surface and at intervals of 50 mm of depth down for the total layer thickness, in accordance with ASTM D 2922 and ASTM D 3017. Sieve analysis tests shall be conducted on composite samples, taken adjacent to the density test locations, which represent the total layer thickness. One set of tests (i.e. density, moisture, and sieve analysis) shall be taken before compaction and after each subsequent compaction pass at three separate locations as directed by the Contracting Officer. Compaction passes and density readings shall continue until the difference between the average dry densities of any two consecutive passes is less than or equal to 8 kg per cubic meter (0.5 pcf).

#### 3.1.7 Evaluation

Within 10 days of completion of the test section, the Contractor shall submit to the Contracting Officer a Test Section Construction Report complete with all required test data and correlations. The Contracting Officer will evaluate the data and provide to the Contractor the required number of passes of the roller, the dry density for field density control during construction, the depth at which to check the density, and the need for a final static pass of the roller.

#### 3.2 PREPARATION OF UNDERLYING COURSE

Prior to constructing the drainage layer, the underlying course shall be cleaned of all foreign materials. During construction, the underlying course shall contain no frozen material. The underlying course shall conform to Section 02721 SUBBASE COURSES. Ruts or soft yielding spots in the underlying courses having inadequate compaction and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line, and grade, and recompacting to specified density. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the drainage layer is placed.

# 3.3 TRANSPORTING MATERIAL

#### 3.3.1 Aggregate Drainage Layer Material

Aggregate drainage layer material shall be transported to the site in a manner which prevents segregation and contamination of materials.

#### 3.4 PLACING

## 3.4.1 General Requisites

Drainage layer material shall be placed on the underlying course in lifts of uniform thickness using equipment meeting the requirements of paragraph EQUIPMENT. When a compacted layer 150 mm or less in thickness is required, the material shall be placed in a single lift. When a compacted layer in excess of 150 mm is required, the material shall be placed in lifts of equal thickness. No lift shall exceed 150 mm or be less than 75 mm when compacted. The lifts when compacted after placement shall be true to the grades or levels required with the least possible surface disturbance. Where the drainage layer is placed in more than one lift, the previously constructed lift shall be cleaned of loose and foreign material. Such adjustments in placing procedures or equipment shall be made to obtain true grades and minimize segregation and degradation of the drainage layer material.

## 3.4.2 Hand Spreading

In areas where machine spreading is impractical, drainage layer material shall be spread by hand. The material shall be spread uniformly in a loose layer to prevent segregation. The material shall conform to the required grade and thickness after compaction.

### 3.5 COMPACTION REQUIREMENTS

Compaction shall be accomplished using rollers meeting the requirements of paragraph EQUIPMENT and operating at a rolling speed of no greater than 2.4 km per hour. Each lift of drainage material, including shoulders when specified under the shoulders, shall be compacted with the number of passes of the roller as specified by the Contracting Officer. In addition, a minimum field dry density, as specified by the Contracting Officer, shall be maintained. If the required field dry density is not obtained, the number of roller passes shall be adjusted in accordance with paragraph DEFICIENCIES. Excessive rolling resulting in crushing of aggregate particles shall be avoided. In all places not accessible to the rollers, the drainage layer material shall be compacted with mechanical hand operated tampers.

#### 3.6 FINISHING

The top surface of the drainage layer shall be finished after final compaction as determined from the test section. Adjustments in rolling and finishing procedures shall be made to obtain grades and minimize segregation and degradation of the drainage layer material.

## 3.7 EDGES OF DRAINAGE LAYER

Shoulder material shall be placed along the edges of the drainage layer course in a quantity that will compact to the thickness of the layer being constructed. When the drainage layer is being constructed in 2 or more lifts, at least a 300 mm width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each lift of the drainage layer.

#### 3.8 SMOOTHNESS TEST

The surface of the top lift shall not deviate more than 10 mm when tested with a 3.05 m 10 footstraightedge applied parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding 10 mm shall be corrected in accordance with paragraph DEFICIENCIES.

#### 3.9 THICKNESS CONTROL

The completed thickness of the drainage layer shall be within 13 mm of the thickness indicated on the drawings. Thickness shall be measured at intervals providing at least one measurement for each 500 square meters of drainage layer. Measurements shall be made in test holes at least 75 mm in diameter. Where the measured thickness is more than 13 mm deficient, such areas shall be corrected in accordance with paragraph DEFICIENCIES. Where the measured thickness is 13 mm more than indicated, it will be considered as conforming to the requirements plus 13 mm, provided the surface of the drainage layer is within 13 mm of established grade. The average job thickness shall be the average of all job measurements as specified above but within 8 mm of the thickness shown on the drawings.

#### 3.10 DEFICIENCIES

#### 3.10.1 Grade and Thickness

Deficiencies in grade and thickness shall be corrected so that both grade and thickness tolerances are met. Thin layers of material shall not be added to the top surface of the drainage layer to meet grade or increase thickness. If the elevation of the top of the drainage layer is more than 13 mm above the plan grade it shall be trimmed to grade and finished in accordance with paragraph FINISHING. If the elevation of the top surface of the drainage layer is 13 mm or more below the required grade, the surface of the drainage layer shall be scarified to a depth of at least 75 mm, new material shall be added, and the layer shall be blended and recompacted to bring it to grade. Where the measured thickness of the drainage layer is more than 13 mm deficient, such areas shall be corrected by excavating to the required depth and replaced with new material to obtain a compacted lift thickness of at least 75 mm. The depth of required excavation shall be controlled to keep the final surface elevation within grade requirements and to preserve layer thicknesses of materials below the drainage layer.

# 3.10.2 Density

Density shall be considered deficient if the field dry density test results are below the dry density specified by the Contracting Officer. If the densities are deficient, the layer shall be rolled with 2 additional passes of the specified roller. If the dry density is still deficient, work will be stopped until the cause of the low dry densities can be determined by the Contracting Officer.

### 3.10.3 Smoothness

Deficiencies in smoothness shall be corrected as if they are deficiencies in grade or thickness. All tolerances for grade and thickness shall be maintained while correcting smoothness deficiencies.

-- End of Section --

#### SECTION 02721

# SUBBASE COURSES 03/97

#### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180 (1993) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457-mm (18-in) Drop

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 88 ASTM C 131	(1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate (1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

## 1.2 DEGREE OF COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in AASHTO T 180, Method D. In this specification, degree of compaction shall be a percentage of laboratory maximum density.

# 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment; .

List of proposed equipment to be used in performance of construction work, including descriptive data.

SD-07 Certificates

Material Source; G-RE.

Source of the material to be used for producting aggregates in accordance with subparagraph: Approval of Materials. This shall be submitted with the report below

SD-06 Test Reports

Sampling and Testing; G-GD. Copies of initial and in-place test results.

#### 1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved testing laboratory in accordance with Section 01440 CONTRACTOR QUALITY CONTROL. Tests shall be performed at the specified frequency. No work requiring testing will be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements.

#### 1.4.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

# 1.4.2 Tests

# 1.4.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136. Sieves shall conform to ASTM E 11.

# 1.4.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

## 1.4.2.3 Moisture-Density Determinations

The maximum density and optimum moisture shall be determined in accordance with AASHTO T 180, Method D.

#### 1.4.2.4 Density Tests

Density shall be field measured in accordance with ASTM D 1556, ASTM D 2167 or ASTM D 2922. For the method presented in ASTM D 1556 the base plate as shown on the drawings shall be used. Fort the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted, if necessary, using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and, when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration, in ASTM D 2922, on each different type of material to be tested at the beginning of a job and at intervals as directed.

#### 1.4.2.5 Soundness Test

Soundness tests shall be made in conformance with ASTM C 88.

#### 1.4.2.6 Wear Test

Wear tests shall be made on subbase course material in conformance with  $ASTM\ C\ 131.$ 

## 1.4.3 Testing Frequency

#### 1.4.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation.

- a. Sieve Analysis not including 0.02 mm size material
- b. Liquid limit and plasticity index moisture-density relationship
- c. Wear Test
- d. Soundness Test

#### 1.4.3.2 In-Place Tests

One of each of the following tests shall be performed on samples taken from the placed and compacted subbase course. Samples shall be taken for each 835 square meters of each layer of material placed in each area and not less than on test for each day's placement.

- a. Sieve Analysis not including 0.02 mm size material
- b. Field Density
- c. Moisture liquid limit and plasticity index

# 1.4.4 Approval of Material

The source of the material shall be selected at least 60 days prior to the time the material will be required in the work. Initial approval of the source will be based on an inspection by the Contracting Officer. Initial approval of material will be based on tests of samples for the specific job. Final approval of both the source and the material will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted subbase course.

### 1.5 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 2 degrees C. When the temperature falls below 2 degrees C, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

#### 1.6 EQUIPMENT

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

#### PART 2 PRODUCTS

#### 2.1 MATERIALS

#### 2.1.1 Subbase Course

Aggregates shall consist of crushed stone or gravel, screenings, natural sand, or other clean, sound, durable, approved materials processed and blended or naturally combined. Aggregates shall be durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. Material retained on the 4.75 mm sieve shall have a percentage of wear not to exceed 40 percent after 500 revolutions when tested as specified in ASTM C 131, and have a loss not greater than 24 percent weighted average at 5 cycles when tested for soundness in magnesium sulfate in accordance with ASTM C 88. The percentage of flat and/or elongated particles shall not exceed 20 in the fraction retained on the 12.5-mm (1/2 inch) sieve and in the fraction passing the 12.5-mm (1/2 inch) sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. When the course aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set forth herein. In the portion retained on each sieve specified, the crushed gravel shall contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the face. Gradation requirements specified herein shall apply to the completed compacted material. When 2 fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as 2 fractured faces. Aggregates shall have a maximum size of 2mm and be graded continuously well within the limits specified as follows:

> Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation No. 1

50 mm 100
37.5 mm 70-100

Liquid Limit and plasticity index requirements stated herein shall apply to any aggregate component that is blended to meet the required gradation and also to the aggregate in the completed aggretgate surface. The portion of

any blended component and of the completed course passing the 0.425~mm shall be either nonplastic or shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

## PART 3 EXECUTION

#### 3.1 OPERATION OF AGGREGATE SOURCES

All clearing, stripping and excavating work involved in the opening or operation of aggregate sources shall be performed by the Contractor. Aggregate sources shall be opened to working depth in a manner that produces excavation faces that are as nearly vertical as practicable for the materials being excavated. Materials excavated from aggregate sources shall be obtained in successive cuts extending through all exposed strata. All pockets or strata of unsuitable materials overlying or occurring in the deposit shall be wasted as directed. The methods of operating aggregate sources and the processing and blending of the material may be changed or modified by the Contracting Officer, when necessary, in order to obtain material conforming to specified requirements. Upon completion of work, aggregate sources on Government reservations shall be conditioned to drain readily, and shall be left in a satisfactory condition. Aggregate sources on private lands shall be conditioned in agreement with local laws and authorities.

#### 3.2 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer so as to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

#### 3.3 PREPARATION OF UNDERLYING MATERIAL

Prior to constructing the subbase course, the underlying course or subgrade shall be cleaned of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Ruts, or soft yielding spots, in the underlying courses, subgrade areas having inadequate compaction, and deviations of the surface from the specified requirements, shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the subbase course is placed.

### 3.4 GRADE CONTROL

The finished and completed subbase course shall conform to the lines, grades, and cross sections shown. The lines, grades, and cross sections shown shall be maintained by means of line and grade stakes placed by the Contractor at the work site.

# 3.5 MIXING AND PLACING MATERIALS

The materials shall be mixed and placed to obtain uniformity of the subbase

material at the water content specified. The Contractor shall make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

## 3.6 LAYER THICKNESS

The compacted thickness of the completed course shall be as indicated. When a compacted layer of 150 mm is specified, the material may be placed in a single layer; when a compacted thickness of more than 150 mm is required, no layer shall exceed 150 mm nor be less than 75 mm when compacted.

#### 3.7 COMPACTION

Each layer of the subbase course shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 2 percent of optimum water content, as determined from laboratory tests, as specified in paragraph SAMPLING AND TESTING. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer is compacted through the full depth to at least 95 percent of laboratory maximum density. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory subbase course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

### 3.8 EDGES

Approved material shall be placed along the edges of the subbase course in such quantity as will compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, at least a 300 mm width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the subbase course, as directed.

# 3.9 SMOOTHNESS TEST

The surface of each layer shall not show deviations in excess of 10 mm when tested with a  $3.6\ m$  ( $12\ foot$ ) straightedge applied parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding this amount shall be corrected by removing material, replacing with new material, or reworking existing material and compacting, as directed.

# 3.10 THICKNESS CONTROL

The completed thickness of the subbase course shall be in accordance with the thickness and grade indicated on the drawings. The thickness of each course shall be measured at intervals providing at least one measurement for each 400 square meters or part thereof of subbase course. The thickness measurement shall be made by test holes, at least 75 mm in diameter through the course. The completed subbase course shall not be more than 13 mm deficient in thickness nor more than 13 mm above or below the established grade. Where any of these tolerances are exceeded, the

Contractor shall correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 13 mm or more thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 13 mm. The average job thickness shall be the average of the job measurements as specified above but within 6 mm of the thickness shown.

#### 3.11 MAINTENANCE

The subbase course shall be maintained in a satisfactory condition until accepted.

-- End of Section --

## SECTION 02722

# GRADED, CRUSHED AGGREGATE BASE COURSE AND RIGID BASE COURSE 12/97

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180 (1993) Moisture-Density Relations of Soils Using a 10-lb. (4.54 kg) Rammer and an 18-in (457 mm) Drop

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 88	(1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM E 11 (1995) Wire-Cloth Sieves for Testing Purposes

ASTM E 548 (1994) General Criteria Used for Evaluating Laboratory Competence

#### 1.2 DEGREE OF COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in AASHTO T 180, Method D. This will be abbreviated herein after as percentage of laboratory maximum density.

#### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment;

List of proposed equipment to be used in performance of construction work, including descriptive data.

SD-07 Certificates

Material Source; G-GD

Source of the material to be used for producting aggregates in accordance with subparagraph: Approval of Materials. This shall be submitted with the report below.

SD-06 Test Reports

Sampling and Testing; G-GD

SAMPLING AND TESTING; G-Gd

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor, subject to approval.

Copies of initial and in-place test results.

## 1.4 EQUIPMENT

# 1.4.1 Approval

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as indicated.

### 1.4.2 Weather Limitation

Base courses shall be placed when the atmospheric temperature is above 2 degrees C. Areas of completed base course that are damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirement.

#### 1.5 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor, subject to approval. If the Contractor elects to establish its own testing facilities, approval of such facilities shall be based on compliance with ASTM E 548, and work requiring testing will not be permitted until the Contractor's facilities have been inspected and approved. The first inspection of the facilities will be at the expense of the Government and any subsequent inspections, required because of failure of the first inspection, shall be at the expense of the Contractor. Such costs will be deducted from the total amount due the Contractor. The materials shall be tested to establish compliance with the specified requirements. Copies of test results shall be furnished to the Contracting Officer.

## 1.5.1 Sampling

Sampling for material gradation, liquid limit, and plastic limit tests shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

## 1.5.2 Tests

#### 1.5.2.1 Initial Tests

One of each of the following tests shall be performed on the proposed material, prior to commencing construction for each source of material: Sieve analysis, wear test, soundness, liquid limit and plasticity index, and moisture-density relationships. Test results shall be submitted to the Contracting Officer prior to commencing construction.

# 1.5.2.2 Sieve Analyses

Sieve analyses shall be made in conformance with ASTM C 117 and ASTM C 136. Sieves shall conform to ASTM E 11.

# 1.5.2.3 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

# 1.5.2.4 Testing Frequency

Testing frequency for sieve analysis, liquid limit and plasticity index: Results shall varify that the material complies with the specifications. After the initial test, a minimum of one analysis shall be performed for each 1,000 metric ton (1,000 tons) of material placed, with a minimum of one analysis for each day's placement until the base course is completed. When the source of materials is changed or deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced.

## 1.5.2.5 Density Tests

Density shall be measured in the field in accordance with ASTM D 1556 or ASTM D 2922. For the method presented in ASTM D 1556 the base plate as shown in the drawing shall be used. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph Calibration of the ASTM publication. Tests performed in accordance with ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals as directed. Not less than one test shall be made to determine the field density of the compacted base course for each 1000 square meters (1000 square yards) of each layer of material placed and not less than one test for each day's placement.

#### 1.5.2.6 Soundness Test

Soundness tests shall be made in conformance with ASTM C 88.

#### 1.5.2.7 Wear Test

Wear tests shall be made in conformance with ASTM C 131.

### 1.5.3 Approval of Material

The source of the material to be used for producing aggregates shall be selected 60 days prior to the time the material will be required in the work. Tentative approval of the source will be based on an inspection by the Contracting Officer. Tentative approval of material will be based on tests of samples for the specific job. Final approval of both the source and the material will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted base course.

# PART 2 PRODUCTS

#### 2.1 AGGREGATES

Aggregates shall consist of clean, sound, durable particles of crushed stone or crushed gravel, and screenings. The Contractor shall obtain materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein, after compaction operations have been completed. The aggregates shall be free of silt and clay as defined by ASTM D 2487, vegetable matter, and other objectionable materials or coatings. The portion retained on the 4.75 mm sieve shall be known as coarse aggregate; that portion passing the 4.75 mm sieve shall be known as fine aggregate.

## 2.1.1 Coarse Aggregates

Coarse aggregates shall be angular particles of uniform density. The coarse aggregate shall have a loss not greater than 24 percent weighted averaged at 5 cycles when tested for soundness in magnesium sulfate in

accordance with ASTM C 88. The coarse aggregate shall have a percentage of wear not to exceed 40 after 500 revolutions as determined by ASTM C 131. The percentage of flat and/or elongated particles shall not exceed 20 in the fraction retained on the 13 mm sieve and in the fraction passing the 13 mm sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements. Crushed gravel shall be manufactured from gravel particles 90 percent of which by weight are retained on the maximum-size sieve listed in TABLE I. In the portion retained on each sieve specified, the crushed gravel shall contain at least 90 percent by weight of crushed pieces having 2 or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the plane. When 2 fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as 2 fractured faces.

## 2.1.2 Fine Aggregate

Fine aggregate shall be natural sand or angular particles produced by crushing stone or gravel that meets the requirements for wear and soundness specified for coarse aggregate.

#### 2.1.3 Gradation Requirements

Gradation requirements specified shall apply to the completed base course. The aggregates shall have a maximum size of mm and be graded continuously within the limits specified in TABLE I. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

	eve nation	No.	1
50.0	<b></b>	100	
37.5	mm	70-1	00
25	mm	45-8	0
12.5	mm	30-6	0
4.75	mm	20-5	0
2	mm	15-4	0
0.425	mm	5-25	
0.075	mm	0-10	

NOTE 1: The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves may require appropriate correction by the Contracting Officer when aggregates of varying specific gravities are used.

#### 2.1.4 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements stated herein shall apply to any aggregate component that is blended to meet the required gradation and also to the aggregate in the completed base course. The portion of the aggregate passing the 0.425 mm sieve shall be either nonplastic or have a

liquid limit not greater than 25 and a plasticity index not greater than 5.

#### PART 3 EXECUTION

#### 3.1 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

#### 3.2 PREPARATION OF UNDERLYING COURSE

Prior to constructing the crushed, aggregate base course, the underlying course shall be cleaned of all foreign substances. At the time of construction of the base course, the underlying course shall contain no frozen material. The underlying course shall conform to Section LIME-MODIFIED SUBGRADE or SUBBASE COURSES. Ruts or soft, yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements specified shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the base course is placed.

#### 3.3 GRADE CONTROL

During construction, the lines and grades, including crown and cross slope indicated for the base course, shall be maintained by means of line and grade stakes placed by the Contractor.

#### 3.4 MIXING OF MATERIALS

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make such adjustments in mixing procedures or in equipment as may be directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to ensure a satisfactory base course meeting requirements of this specification.

#### 3.5 PLACING

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 150 mm or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 150 mm is required, the material shall be placed in layers of equal thickness. No layer shall exceed 150 mm or be less than 75 mm when compacted. The layers, when compacted, shall be true to the grades or levels required, with the least possible surface disturbance. Where the base course is placed in more than 1 layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Adjustments in placing procedures or equipment shall be made as directed, to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to ensure an

acceptable base course.

## 3.6 COMPACTION

# 3.6.1 Requirements

Each layer of base course, including shoulders, shall be compacted to produce an average field-measured density, through the full depth, of at least 100 percent of laboratory maximum density obtained in the laboratory for graded crushed aggregate base course and 95 percent of laboratory maximum density for rigid base course. Water content shall be maintained during the compaction procedure and subsequent proof rolling of designated areas. Water content shall be within plus or minus 2 percent of optimum water content, as determined from laboratory tests and as specified in density test procedures listed in paragraph SAMPLING AND TESTING. In places not accessible to the rollers, the base course material shall be compacted with mechanical tampers.

# 3.6.2 Finishing

The surface of top layer of base course shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of top layer of base course is 13 mm or more below the grade, the top layer of base shall be scarified to a depth of at least 75 mm, new material shall be added, and the layer shall be blended and recompacted to bring to grade. Adjustments in rolling and finishing procedures shall be made as may be directed to obtain grades, to minimize segregation and degradation of base course material, to adjust the water content, and to ensure an acceptable base course. Material found unacceptable shall be removed and replaced, as directed, with acceptable material.

## 3.7 EDGES OF BASE COURSE

Acceptable material shall be placed along the edges of the base course that will compact to the thickness of the course being constructed. When the course is being constructed in 2 or more layers, at least a 300 mm width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the base course, as directed.

#### 3.8 SMOOTHNESS TEST

The surface of the top layer shall not deviate more than 10 mm when tested with a 3.05 m straightedge applied parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding 10 mm shall be corrected as directed.

#### 3.9 THICKNESS CONTROL

The completed thickness of the base course shall be within 13 mm of the thickness indicated. The thickness of the base course shall be measured at intervals of one measurement for at least each 400 square meters of base course. The depth measurement shall be made by test holes at least 75 mm in diameter. Where the measured thickness of the base course is more than 13 mm deficient, such areas shall be corrected by excavating to the required depth and replacing with new material. Where the measured thickness of the base course is 13 mm more than indicated, it will be considered as conforming with the requirements plus 13 mm, provided the

surface of the base course is within 13~mm of established grade. The average job thickness shall be the average of the job measurements as specified above but within 6~mm of the thickness indicated.

# 3.10 MAINTENANCE

The base course shall be maintained in a condition that will meet specification requirements until accepted.

-- End of Section --

#### SECTION 02748

# BITUMINOUS TACK AND PRIME COATS 01/98

#### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 40 (1978; R 1983) Sampling Bituminous Materials

## AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM D 140	(1993) Sampling Bituminous Materials
ASTM D 977	(1991) Emulsified Asphalt
ASTM D 2027	(1976; R 1992) Cutback Asphalt (Medium-Curing Type)
ASTM D 2397	(1994) Cationic Emulsified Asphalt
ASTM D 2995	(1993) Determining Application Rate of Bituminous Distributors

# 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Tests; G-RE.

Copies of all test results for bituminous materials, within 24 hours of completion of tests. Certified copies of the manufacturer's test reports indicating compliance with applicable specified requirements, not less than 30 days before the material is required in the work.

## 1.3 PLANT, EQUIPMENT, MACHINES AND TOOLS

## 1.3.1 General Requirements

Plant, equipment, machines and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all

times.

#### 1.3.2 Bituminous Distributor

The distributor shall have pneumatic tires of such size and number to prevent rutting, shoving or otherwise damaging the base surface or other layers in the pavement structure. The distributor shall be designed and equipped to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

#### 1.3.3 Power Brooms and Power Blowers

Power brooms and power blowers shall be suitable for cleaning the surfaces to which the bituminous coat is to be applied.

#### 1.4 WEATHER LIMITATIONS

Bituminous coat shall be applied only when the surface to receive the bituminous coat is dry. Bituminous coat shall be applied only when the atmospheric temperature in the shade is 10 degrees C or above and when the temperature has not been below 2 degrees C for the 12 hours prior to application.

#### PART 2 PRODUCTS

# 2.1 TACK COAT

Emulsified asphalt shall conform to ASTM D 977 or ASTM D 2397, for Type SS-1, SS-1h, CSS-1, or CSS-1h.

#### 2.2 PRIME COAT

Cutback asphalt shall conform to ASTM D 2027, Grade MC-30 or MC-70.

# PART 3 EXECUTION

### 3.1 PREPARATION OF SURFACE

Immediately before applying the bituminous coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated. The surface shall be dry and clean at the time of treatment.

## 3.2 APPLICATION RATE

The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

# 3.2.1 Tack Coat

Bituminous material for the tack coat shall be applied in quantities of not

less than  $0.20\ \text{liter}$  nor more than  $0.70\ \text{liter}$  per square meter of pavement surface.

# 3.2.2 Prime Coat

Bituminous material for the prime coat shall be applied in quantities of not less than 0.70 liter nor more than 1.80 liters per square meter of pavement surface.

#### 3.3 APPLICATION TEMPERATURE

### 3.3.1 Viscosity Relationship

Asphalt application temperature shall provide an application viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 square mm/sec, kinematic. The temperature viscosity relation shall be furnished to the Contracting Officer.

# 3.3.2 Temperature Ranges

The viscosity requirements shall determine the application temperature to be used. The following is a normal range of application temperatures:

Liquid Asphalts		
[MC-30	29-87 degrees C]	
[MC-70	50-107 degrees C]	
	Emulsions	
[SS-1	20-70 degrees C]	
[SS-1h	20-70 degrees C]	
[CSS-1	20-70 degrees C]	
[CSS-1h	20-70 degrees C]	

\*These temperature ranges exceed the flash point of the material and care should be taken in their heating.

# 3.4 APPLICATION

Following preparation and subsequent inspection of the surface, the bituminous coat shall be applied at the specified rate with uniform distribution over the surface to be treated. All areas and spots missed by the distributor shall be properly treated with the hand spray. Until the succeeding layer of pavement is placed, the surface shall be maintained by protecting the surface against damage and by repairing deficient areas at no additional cost to the Government. If required, clean dry sand shall be spread to effectively blot up any excess bituminous material. No smoking, fires, or flames other than those from the heaters that are a part of the equipment shall be permitted within 8 meters of heating, distributing, and transferring operations of bituminous material other than bituminous emulsions. To obtain uniform application of the prime coat on the surface treated at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application to start and stop the prime coat on the paper. Immediately after application, the building paper shall be removed and destroyed.

#### 3.5 CURING PERIOD

Following application of the bituminous material and prior to application of the succeeding layer of pavement, the bituminous coat shall be allowed to cure and to obtain evaporation of any volatiles or moisture. Prime coat shall be allowed to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course.

#### 3.6 FIELD QUALITY CONTROL

Samples of the bituminous materialused shall be obtained by the Contractor as directed, under the supervision of the Contracting Officer. The sample may be retained and tested by the Government at no cost to the Contractor.

## 3.7 SAMPLING AND TESTING

Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved.

#### 3.7.1 Sampling

The samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140 or AASHTO T 40. Sources from which bituminous materials are to be obtained shall be selected and notification furnished the Contracting Officer within 15 days after the award of the contract.

#### 3.7.2 Calibration Test

The Contractor shall furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibration shall be made with the approved job material and prior to applying the bituminous coat material to the prepared surface. Calibration of the bituminous distributor shall be in accordance with ASTM D 2995.

# 3.7.3 Trial Applications

Before providing the complete bituminous coat, three lengths of at least 30 meters for the full width of the distributor bar shall be applied to evaluate the amount of bituminous material that can be satisfactorily applied.

## 3.7.3.1 Tack Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous tack coat materials shall be applied in the amount of 0.20 liters per square meter. Other trial applications shall be made using various amounts of material as may be deemed necessary.

# 3.7.3.2 Prime Coat Trial Application Rate

Unless otherwise authorized, the trial application rate of bituminous materials shall be applied in the amount of 1.10 liters per square meter. Other trial applications shall be made using various amounts of material as may be deemed necessary.

# 3.7.4 Sampling and Testing During Construction

Quality control sampling and testing shall be performed as required in paragraph FIELD QUALITY CONTROL.

-- End of Section --

#### SECTION 02760

# FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS 03/97

#### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by the basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 789	(1994) Determination of Relative Viscosity, Melting Point, and Moisture Content of Polyamide (PA)
ASTM D 3405	(1994) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements
ASTM D 3569	(1985; R 1991) Joint Sealant, Hot-Applied, Elastomeric, Jet-Fuel-Resistant-Type for Portland Cement Concrete Pavements

#### CORPS OF ENGINEERS (COE)

COE CRD-C 525	(1989) Corps of Engineers Test Method for
	Evaluation of Hot-Applied Joint Sealants
	for Bubbling Due to Heating

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Manufacturer's Instructions

Manufacturer's Recommendations; .

Where installation procedures, or any part thereof, are required to be in accordance with the manufacturer's recommendations, printed copies of these recommendations shall be submitted at least 30 days prior to use on the project. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

SD-01 Preconstruction Submittals

Construction Equipment List; .

List of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

SD-07 Certificates

Sealant and Back-up Materials; G-RE.

Certified certificate(s) with test data showing compliance with the laboratory test requirements. No material will be allowed to be used until it has been approved.

## 1.3 Safety

Joint sealant shall not be placed within 8 meters of any liquid oxygen (LOX) equipment, LOX storage, or LOX piping. Joints in this area shall be thoroughly cleaned and left unsealed.

## 1.4 TEST REQUIREMENTS

The joint sealant and backup or separating material shall be tested for conformance with the referenced applicable material specification. Testing of the materials shall be performed in an approved independent laboratory and certified copies of the test reports shall be submitted and approved 60 days prior to the use of the materials at the job site. Samples will be retained by the Government for possible future testing should the materials appear defective during or after application. Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

## 1.5 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

# 1.5.1 Joint Cleaning Equipment

# 1.5.1.1 Tractor-Mounted Routing Tool

The routing tool used for removing old sealant from the joints shall be of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

## 1.5.1.2 Concrete Saw

A self-propelled power saw with water-cooled diamond or abrasive saw blades will be provided for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

#### 1.5.1.3 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 6.4 mm (1/4 inch). The air compressor shall be portable and shall be capable of furnishing not less than 71 liters per second (150 cubic feet per minute) and maintaining a line pressure of not less than 621 kPa (90 psi) at the nozzle while in use. Compressor capability under job conditions must be demonstrated before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjusted as necessary to secure satisfactory results.

# 1.5.1.4 Waterblasting Equipment

Waterblasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. The water tank and auxiliary resupply equipment shall be of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 25 mmabove the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjustable as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in pounds per square inch at which the equipment is operating.

# 1.5.1.5 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

## 1.5.2 Sealing Equipment

#### 1.5.2.1 Hot-Poured Sealing Equipment

The unit applicators used for heating and installing joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

#### 1.6 TRIAL JOINT SEALANT INSTALLATION

Prior to the cleaning and sealing of the joints for the entire project, a test section of at least 60 m long shall be prepared using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, the test section shall be inspected to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to

the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. All other joints shall be prepared and sealed in the manner approved for sealing the test section.

## 1.7 DELIVERY AND STORAGE

Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided by the Contractor at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

#### 1.8 ENVIRONMENTAL CONDITIONS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 10 degrees C and rising at the time of application of the materials. Sealant shall not be applied if moisture is observed in the joint.

#### PART 2 PRODUCTS

#### 2.1 SEALANTS

Materials for sealing cracks in the various paved areas indicated on the drawings shall be as follows:

Area	Sealing Material
Roadways	ASTM D 3405 and COE CRD-C 525
Aircraft Access Aprons	ASTM D 3569 and COE CRD-C 525

## 2.2 PRIMERS

Primers, when their use is recommended by the manufacturer of the sealant, shall be as recommended by the manufacturer of the sealant.

# 2.3 BACKUP MATERIALS

The backup material shall be a compressible, nonshrinking, nonstaining, nonabsorbing material and shall be nonreactive with the joint sealant. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

# 2.4 BOND BREAKING TAPES

The bond breaking tape or separating material shall be a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 3 mm wider than the nominal width of the joint and shall not bond to the joint sealant.

#### PART 3 EXECUTION

#### 3.1 PREPARATION OF JOINTS

Immediately before the installation of the sealant, the joints shall be thoroughly cleaned to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

# 3.1.1 Existing Sealant Removal

The in-place sealant shall be cut loose from both joint faces and to the depth shown on the drawings, using the tractor-mounted routing equipment, concrete saw or waterblaster as specified in paragraph EQUIPMENT. Depth shall be sufficient to accommodate any separating or backup material that is required to maintain the depth of new sealant to be installed. Prior to further cleaning operations, all loose old sealant remaining in the joint opening shall be removed by blowing with compressed air. Hand tools may be required to remove sealant from random cracks. Chipping, spalling, or otherwise damaging the concrete will not be allowed.

## 3.1.2 Sawing

#### 3.1.2.1 Facing of Joints

Facing of joints shall be accomplished using a concrete saw as specified in paragraph EQUIPMENT to remove all residual old sealant and a minimum of concrete from the joint face to provide exposure of newly cleaned concrete, and, if required, to enlarge the joint opening to the width and depth shown on the drawings. The blade shall be stiffened with a sufficient number of suitable dummy (used) blades or washers. Immediately following the sawing operation, the joint opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

# 3.1.2.2 Refacing of Random Cracks

Sawing of the cracks shall be accomplished using a power-driven concrete saw as specified in paragraph EQUIPMENT. The saw blade shall be 152 mm (6 inch) or less in diameter to enable the saw to follow the trace of the crack. The blade shall be stiffened as necessary with suitable dummy (or used) blades or washers. Immediately following the sawing operation, the crack opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

## 3.1.3 Sandblasting

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 13 mm from the joint edges shall be waterblasted clean. A multiple-pass technique shall be used until the surfaces are free of dust, dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

# 3.1.4 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, the lower portion of the joint opening shall be plugged or sealed off using a back-up material to prevent the entrance of the sealant below

the specified depth. Care shall be taken to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

## 3.1.5 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, a bond breaker separating tape will be inserted to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. The tape shall be securely bonded to the bottom of the joint opening so it will not float up into the new sealant.

# 3.1.6 Rate of Progress of Joint Preparation

The stages of joint preparation which include sandblasting, air pressure cleaning and placing of the back-up material shall be limited to only that lineal footage that can be sealed during the same day.

#### 3.2 PREPARATION OF SEALANT

# 3.2.1 Hot-Poured Sealants

Sealants conforming to ASTM D 3405 and ASTM D 3569 shall not be heated in excess of the safe heating temperature recommended by the manufacturer as shown on the sealant containers. Sealant that has been overheated or subjected to application temperatures for over 4 hours or that has remained in the applicator at the end of the day's operation shall be withdrawn and wasted.

# 3.2.2 Single-Component, Cold-Applied Sealants

Sealant and containers shall be inspected prior to use. Any materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory shall be rejected. Settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools will not be cause for rejection.

#### 3.3 INSTALLATION OF SEALANT

# 3.3.1 Time of Application

Joints shall be sealed immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

## 3.3.2 Sealing Joints

Immediately preceding, but not more than 15 m ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to 6 mm plus or minus 1.5 mm below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over

newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

### 3.4 INSPECTION

# 3.4.1 Joint Cleaning

Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints shall be approved prior to installation of the separating or back-up material and joint sealant.

# 3.4.2 Joint Sealant Application Equipment

The application equipment shall be inspected to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

### 3.4.3 Joint Sealant

The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

#### 3.5 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site and the pavement shall be left in a clean condition.

-- End of Section --

### SECTION 02763

# PAVEMENT MARKINGS 09/98

### PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

### FEDERAL SPECIFICATIONS (FS)

FS TT-B-1325	(Rev C; Notice 1) Beads (Glass Spheres) Retro-Reflective (Metric)
FS TT-P-1952	(Rev D) Paint, Traffic and Airfield Marking, Waterborne (Metric)

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment Lists; G-RE.

Lists of proposed equipment, including descriptive data, and notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation.

SD-08 Manufacturer's Instructions

Mixing, Thinning and Application; G-RE.

Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

SD-07 Certificates

Qualifications; G-RE.

Document certifying that personnel are qualified for equipment operation and handling of chemicals.

SD-06 Test Reports

Material Tests; G-RE.

Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

SD-07 Certificates

Volatile Organic Compound (VOC) Content; G-RE.

Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

#### 1.4 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

## 1.5 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

## 1.5.1 Paint Application Equipment

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall have a speed during application not less than 8 kilometers per hour (5 mph), and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. The equipment used to apply the paint binder to airfield pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with an arrangement of atomizing nozzles capable of applying a line width at any one time in multiples of 150 mm (6 inches), from 150 mm (6 inches) to 900 mm (36 inches). The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

# 1.5.3 Reflective Media Dispenser

The dispenser for applying the reflective media shall be attached to the paint dispenser and shall operate automatically and simultaneously with the applicator through the same control mechanism. The dispenser shall be capable of adjustment and designed to provide uniform flow of reflective media over the full length and width of the stripe at the rate of coverage specified in paragraph APPLICATION, at all operating speeds of the applicator to which it is attached.

# 1.5.5 Surface Preparation Equipment

## 1.5.5.1 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 70.8 liters per sec (150 cfm) of air at a pressure of not less than 620 kPa (90 psi) at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

# 1.5.5.2 Waterblast Equipment

The water pressure shall be specified at 17.9 MPa (2600 psi) at 60 degrees C (140 degrees F in order to adequately clean the surfaces to be marked.

# 1.5.6 Marking Removal Equipment

Equipment shall be mounted on rubber tires and shall be capable of removing markings from the pavement without damaging the pavement surface or joint sealant. Waterblasting equipment shall be capable of producing an adjustable, pressurized stream of water. Sandblasting equipment shall include an air compressor, hoses, and nozzles. The compressor shall be equipped with traps to maintain the air free of oil and water.

## 1.5.6.1 Shotblasting Equipment

Shotblasting equipment shall be capable of producing an adjustable depth of removal of marking and pavement. Each unit shall be self-cleaning and self-contained, shall be able to confine dust and debris from the operation, and shall be capable of recycling the abrasive for reuse.

## 1.5.6.2 Chemical Equipment

Chemical equipment shall be capable of application and removal of chemicals from the pavement surface, and shall leave only non-toxic biodegradeable residue.

# 1.5.7 Traffic Controls

Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

# 1.6 HAND-OPERATED, PUSH-TYPE MACHINES

All machines, tools, and equipment used in performance of the work shall be

approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

## 1.8 WEATHER LIMITATIONS FOR REMOVAL

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 5 degrees C and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

### PART 2 PRODUCTS

#### 2.1 PAINT

The paint shall be lead free, homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for airfields, roads, and streets shall conform to FS TT-P-1952. Select Type 1, "Ten Minute No Pick-up Time" or Type II, "Fast Dry, High Humidity Formula." The color shall be as indicated for the parking lot and access road. Colors for the apron shall be the following color chips from FS 595: Yellow - 33538 and Black 37038. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

## 2.5 REFLECTIVE MEDIA

Reflective media for airfields shall conform to FS TT-B-1325, Type I, Gradation A with refraction index of 1.5.

# 2.6 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a sample shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.

## PART 3 EXECUTION

## 3.1 SURFACE PREPARATION

Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

## 3.1.1 Pretreatment for Early Painting

Where early painting is required on rigid pavements, a pretreatment with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride shall be applied to prepared pavement areas prior to painting.

## 3.1.2 Cleaning Existing Pavement Markings

In general, markings shall not be placed over existing pavement marking patterns. Existing pavement markings, which are in good condition but interfere or conflict with the newly applied marking patterns, shall be removed. Deteriorated or obscured markings that are not misleading or confusing or interfere with the adhesion of the new marking material do not require removal. Whenever grinding, scraping, sandblasting or other operations are performed the work must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. When these operations are completed the pavement surface shall be blown off with compressed air to remove residue and debris resulting from the cleaning work.

# 3.1.3 Cleaning Concrete Curing Compounds

On new Portland cement concrete pavements, cleaning operations shall not begin until a minimum of 30 days after the placement of concrete. All new concrete pavements shall be cleaned by either sandblasting or water blasting. The extent of the blasting work shall be to clean and prepare the concrete surface as follows:

- a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.
- b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.
- c. All remaining curing compound is intact; all loose and flaking material is removed.
- d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.
  - e. The surface to be marked is dry.

## 3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

## 3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 5 degrees C and less than 35 degrees C. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

## 3.2.1.1 Rate of Application

- a. Reflective Markings: Pigmented binder shall be applied evenly to the pavement area to be coated at a rate of  $2.9~\rm plus$  or minus  $0.5~\rm square$  meter per liter. Glass spheres shall be applied uniformly to the wet paint on airfield pavement at a rate of  $1.0~\rm m$
- b. Nonreflective Markings: The parking lot paint shall be applied evenly to the pavement surface to be coated at a rate of 2.9 plus or minus 0.5 square meter per liter.

# 3.2.1.2 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

## 3.2.5 Reflective Media

Application of reflective media shall immediately follow application of pigmented binder. Drop-on application of glass spheres shall be accomplished to insure that reflective media is evenly distributed at 3.6 to 3.9 KG per 11.24 square meters (eight to nine pounds per gallon of paint). Should there be malfunction of either paint applicator or reflective media dispenser, operations shall be discontinued immediately until deficiency is corrected.

# 3.3 MARKING REMOVAL

Pavement marking, shall be removed in the areas shown on the drawings. Removal of marking shall be as complete as possible without damage to the surface. Aggregate shall not be exposed by the removal process. After the markings are removed, the cleaned pavement surfaces shall exhibit adequate texture for remarking as specified in paragraph SURFACE PREPARATION. Contractor shall demonstrate removal of pavement marking in an area designated by the Contracting Officer. The demonstration area will become the standard for the remainder of the work.

# 3.3.1 Equipment Operation

Equipment shall be controlled and operated to remove markings from the

pavement surface, prevent dilution or removal of binder from underlying pavement, and prevent emission of blue smoke from asphalt or tar surfaces.

# 3.3.2 Cleanup and Waste Disposal

The worksite shall be kept clean of debris and waste from the removal operations. Cleanup shall immediately follow removal operations in areas subject to air traffic. Debris shall be disposed of at approved sites.

-- End of Section --

## SECTION 02770

# CONCRETE SIDEWALKS, CURBS AND GUTTERS, AND EXTERIOR SLABS $03/98\,$

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182 (1991) Burlap Cloth Made from Jute or Kenaf

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

AMERICAN SOCIETY FOR TE	SIING AND MAIERIALS (ASIM)
ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM C 31/C 31M	(1996) Making and Curing Concrete Test Specimens in the Field
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 171	(1997) Sheet Materials for Curing Concrete
ASTM C 172	(1997) Sampling Freshly Mixed Concrete
ASTM C 173	(1996) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 231	(1997) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 309	(1997) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 3405	(1996) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements
CORPS OF ENGINEERS (COE	)
COE CRD-C 527	(1988) Standard Specification for Joint

Sealants, Cold-Applied,

Non-Jet-Fuel-Resistant, for Rigid and Flexible Pavements

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Field Quality Control;

Copies of all test reports within 24 hours of completion of the test.

SD-09 Manufacturer's Field Reports

Concrete;

Copies of certified delivery tickets for all concrete used in the construction.

### 1.3 WEATHER LIMITATIONS

## 1.3.1 Placing During Cold Weather

Concrete placement shall be discontinued when the air temperature reaches 5 degrees C and is falling. Placement may begin when the air temperature reaches 2 degrees C and is rising. Provisions shall be made to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 2 degrees C, placement shall be approved in writing. Approval will be contingent upon full conformance with the following provisions. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited. [Mixing water and aggregates] [Mixing water] [Aggregates] shall be heated as necessary to result in the temperature of the in-place concrete being between 10 and 30 degrees C. Methods and equipment for heating shall be approved. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 10 degrees C for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

# 1.3.2 Placing During Warm Weather

The temperature of the concrete as placed shall not exceed 30 degrees C except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 35 degrees C.

# 1.4 PLANT, EQUIPMENT, MACHINES, AND TOOLS

### 1.4.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Use of the equipment shall be discontinued if it produces unsatisfactory results. The Contracting Officer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

## 1.4.2 Slip Form Equipment

Slip form paver or curb forming machine, will be approved based on trial use on the job and shall be self-propelled, automatically controlled, crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in 1 pass.

### PART 2 PRODUCTS

#### 2.1 CONCRETE

Concrete shall conform to the applicable requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE except as otherwise specified. Concrete shall have a minimum compressive strength of 27.5 MPa at 28 days.

#### 2.1.1 Air Content

Mixtures shall have air content by volume of concrete of 4.5 to 7.5 percent, based on measurements made immediately after discharge from the mixer.

# 2.1.2 Slump

The concrete slump shall be between 50 mm and 100 mm for hand placed concrete and between 25 mm and 75 mm for slipformed concrete, where determined in accordance with ASTM C 143.

## 2.2 CONCRETE CURING MATERIALS

# 2.2.1 Impervious Sheet Materials

Impervious sheet materials shall conform to ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

## 2.2.2 Burlap

Burlap shall conform to AASHTO M 182.

# 2.2.3 Liquid Membrane-Forming Curing Compound

Liquid membrane-forming curing compound shall conform to ASTM C 309, Type 1D or Type 2, Class A or B.

#### 2.4 JOINT FILLER STRIPS

## 2.4.1 Contraction Joint Filler for Curb and Gutter

Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.

# 2.4.2 Expansion Joint Filler, Premolded

Expansion joint filler, premolded, shall conform to ASTM D 1751 or ASTM D 1752, 9.5 mm thick, unless otherwise indicated.

### 2.5 JOINT SEALANTS

# 2.5.1 Joint Sealant, Cold-Applied

Joint sealant, cold-applied shall conform to COE CRD-C 527.

## 2.5.2 Joint Sealant, Hot-Poured

Joint sealant, hot-poured shall conform to ASTM D 3405.

## 2.6 FORM WORK

Form work shall be designed and constructed to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete. Wood forms shall be surfaced plank, 50 mm nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Wood forms shall have a nominal length of 3 m. Radius bends may be formed with 19 mm boards, laminated to the required thickness. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Ends of steel forms shall be interlocking and self-aligning. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Steel forms shall have a nominal length of 3 m with a minimum of 2 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

#### 2.6.1 Sidewalk Forms

Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

# 2.6.2 Curb and Gutter Forms

Curb and gutter outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 3 m or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 38 mm benders, for the full height of the curb, cleated together.

# 2.7 WIRE FABRIC

Welded steel wire fabric shall conform to ASTM A 185.

## PART 3 EXECUTION

#### 3.1 SUBGRADE PREPARATION

The subgrade shall be constructed to the grade and cross section with a maximum deviation of 12.5 mm plus or minus.

# 3.1.1 Sidewalk Subgrade

The subgrade shall be thoroughly wetted and then compacted with two passes of a  $2.22~\mathrm{kN}$  roller. Yielding material deflecting more than  $12.5~\mathrm{mm}$  under the specified roller shall be removed to a depth of not less than  $100~\mathrm{mm}$  below subgrade elevation and replaced with an approved granular material. The material shall then be compacted as described above. The completed subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

## 3.1.2 Exterior Slab Subgrade

Subgrade shall be placed and compacted to conform with applicable requirements of SECTION:LIME MODIFIED SUBGRADE. Base courses, where required, shall be placed and compacted to conform to applicable requirements of SECTION: GRADED CRUSHED AGGREGATE BASE COURSE AND RIGID BASE COURSE.

## 3.1.3 Curb and Gutter Subgrade

The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.

# 3.1.4 Maintenance of Subgrade

The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected to produce a subgrade free from frost when the concrete is deposited.

# 3.2 FORM SETTING

Forms shall be set to the indicated alignment, grade and dimensions. Forms shall be held rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 1.2 meters. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms. Forms shall be removed without injuring the concrete. Bars or heavy tools shall not be used against the concrete in removing the forms. Any concrete found defective after form removal shall be promptly and satisfactorily repaired. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

## 3.2.1 Sidewalks Exterior Slabs

Forms for sidewalks shall be set with the upper edge true to line and grade with an allowable tolerance of 3 mm in any 3 m long section. After forms

are set, grade and alignment shall be checked with a 3.05 m straightedge. Forms shall have a transverse slope of 20 millimeters per meter with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.

## 3.2.2 Curbs and Gutters

The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished, as specified for concrete finishing. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction.

## 3.3 SIDEWALK & EXTERIOR SLAB CONCRETE PLACEMENT AND FINISHING

### 3.3.1 Placement

### 3.3.1.1 Sidewalk

Concrete shall be placed in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted. The concrete shall be consolidated with an approved vibrator, and the surface shall be finished to grade with a wood float, bull float, or darby, edged and broom finished.

## 3.3.1.2 Exterior Slabs

Concrete shall be placed in the forms in layers of such thickness that when compacted and finished the slab will be of the thickness indicated. After concrete has been placed in the forms, a strike-off shall be used to bring the surface to the proper section to be compacted. Concrete 150 mm or less in thickness shall be tamped and consolidated with a suitable wood or metal tamping bar. Concrete more than 150 mm thick shall be consolidated with approved mechanical vibrators.

# 3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, the surface shall be finished to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic.

## 3.3.3 Edge and Joint Finishing

All slab edges, including those at formed joints, shall be finished with an edger having a radius of 3 mm. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger. Corners and edges which have crumbled and areas

which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

## 3.3.4 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 7.9~mm from the testing edge of a3.05 m straightedge. Permissible deficiency in section thickness will be up to 6.4~mm.

## 3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

## 3.4.1 Formed Curb and Gutter

Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators. Curve shaped gutters shall be finished with a standard curb "mule".

# 3.4.2 Curb and Gutter Finishing

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

## 3.4.3 Concrete Finishing

Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 13 mm. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float.

# 3.4.4 Joint Finishing

Curb edges at formed joints shall be finished as indicated.

# 3.4.5 Surface and Thickness Tolerances

Finished surfaces shall not vary more than 6.4~mm from the testing edge of a 3.05~m straightedge. Permissible deficiency in section thickness will be up to 6.4~mm.

## 3.5 SIDEWALK & EXTERIOR SLAB JOINTS

## 3.5.1 Sidewalk Joints

Sidewalk joints shall be constructed to divide the surface into rectangular areas. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 1.5 m on centers, whichever is less, and shall be continuous across the slab. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 3 m or more in width. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated. Expansion joints shall be formed about structures and features

which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.

## 3.5.2 Exterior Slab Joints

Exterior slab joints shall be placed as specified herein unless otherwise shown on the plans.

### 3.5.3 Contraction Joints

The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved. Sawed joints shall be constructed by sawing a groove in the concrete with a 3 mm blade to the depth indicated. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.

# 3.5.4 Expansion Joints

Expansion joints shall be formed with 12.5 mm joint filler strips. Joint filler shall be placed with top edge 6 mm below the surface and shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 3 mm, and concrete over the joint filler shall be removed. At the end of the curing period, expansion joints shall be cleaned and filled with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 10 degrees C at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

## 3.5.5 Sidewalk and Exterior Slab Reinforcement

Welded steel wire fabric shall be placed in all slabs that are irregular shaped. An irregular shaped slab is one which the length to width ratio is greate than 1.25 and it is not essentially a parallelogram. Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties at one-half depth of the slab before the concrete is placed.

## 3.6 CURB AND GUTTER JOINTS

Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.

# 3.6.1 Contraction Joints

Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 1.5 m nor greater than 4.5 m in length. Contraction joints shall be constructed by means of 3 mm thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as

practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing. The Contractor has the option to saw the contraction joints full depth of the curb and into the gutter 1/4 depth.

# 3.6.2 Expansion Joints

Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, expansion joints at least 12.7mm in width shall be provided at intervals not exceeding 35 Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit with the material specified herein. Contraction joints and expansion joints abutting Portland cement concrete pavements shall be sealed with the same sealant as the concrete pavement. Expansion joints and the top 1 inch depth of curb and gutter contraction-joints shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing material shall not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 10 degrees C at the time of application of joint sealing material. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

## 3.7 CURING AND PROTECTION

## 3.7.1 General Requirements

Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

# 3.7.1.1 Mat Method

The entire exposed surface shall be covered with 2 or more layers of burlap. Mats shall overlap each other at least 150 mm. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

## 3.7.1.2 Impervious Sheeting Method

The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 300 mm when a continuous sheet is not used. The curing medium shall not be less than 450 mm wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during

curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

# 3.7.1.3 Membrane Curing Method

A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free water disappears. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage of approximately 5 square meters per liter for both coats. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed. Necessary precautions shall be taken to insure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

# 3.7.2 Backfilling

After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

# 3.7.3 Protection

Completed concrete shall be protected from damage until accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.

# 3.8 FIELD QUALITY CONTROL

### 3.8.1 General Requirements

The Contractor shall perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, the Contractor shall take the action and submit reports as required below, and any additional tests to insure that the requirements of these specifications are met.

# 3.8.2 Concrete Testing

## 3.8.2.1 Strength Testing

The Contractor shall provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 190 cubic meters of concrete. The samples for strength tests shall be taken in accordance with ASTM C 172. Cylinders for acceptance shall be molded in conformance with ASTM C 31/C 31M by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 4 MPa.

### 3.8.2.2 Air Content

Air content shall be determined in accordance with ASTM C 173 or ASTM C 231. ASTM C 231 shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Government inspector. If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

# 3.8.2.3 Slump Test

Two slump tests shall be made on randomly selected batches of each class of concrete for every 190 cubic meters, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

## 3.8.3 Thickness Evaluation

The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.

# 3.8.4 Surface Evaluation

The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

## 3.9 SURFACE DEFICIENCIES AND CORRECTIONS

## 3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 6 mm the deficient section will be removed, between regularly scheduled joints, and replaced.

## 3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 6 mm. Pavement areas requiring grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

### 3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Government and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

# 3.10 SEALING JOINTS

The approximately horizontal sections of expansion joints and the top25 mm depth of contraction-joint openings of gutter shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing shall be done so that the material will not be spilled on exposed surfaces of the concrete. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above10 degrees C, at the time of application of joint-sealing materials. Excess material on exposed surfaces of the concrete shall be removed immediately and exposed concrete surfaces cleaned.

-- End of Section --

# DIVISION 3 - CONCRETE

03100	Structural Concrete Formwork
03150	Expansion Joints, Contracting Joints, and Waterstops
03200	Concrete Reinforcement
03300	Cast-in-Place Structural Concrete
03350	Non-Metallic Light-Reflective Surface-Hardened Concrete Floor

### SECTION 03100

# STRUCTURAL CONCRETE FORMWORK 05/98

### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 347R

(1994) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA ANSI/AHA A135.4

(1995) Basic Hardboard

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1

(1996) Voluntary Product Standard - Construction and Industrial Plywood

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-05 Design Data

Design; .

Design analysis and calculations for form design and methodology used in the design.

Form Materials;

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

SD-02 Shop Drawings

Concrete Formwork; .

Drawings showing details of formwork, including dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal.

SD-08 Manufacturer's Instructions

Form Releasing Agents;.

Manufacturer's recommendation on method and rate of application of form releasing agents.

SD-07 Certificates

Fiber Voids; .

Certificates attesting that fiber voids conform to the specified requirements.

SD-04 Samples

Fiber Voids; .

One sample unit of fiber voids prior to installation of the voids.

## 1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

## 1.4 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

#### PART 2 PRODUCTS

#### 2.1 FORM MATERIALS

# 2.1.1 Forms For Class A and Class B Finish

Forms for Class A and Class B finished surfaces shall be plywood panels conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type.

## 2.1.2 Forms For Class C Finish

Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA ANSI/AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have one vertical seam.

# 2.1.3 Forms For Class D Finish

Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

### 2.1.4 Retain-In-Place Metal Forms

Retain-in-place metal forms for concrete slabs and roofs shall be as specified in Section 05300 STEEL DECKING.

### 2.1.6 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 6 mm nor more than 25 mm deep and not more than 25 mm in diameter. Removable tie rods shall be not more than 38 mm in diameter.

# 2.1.7 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

## PART 3 EXECUTION

## 3.1 INSTALLATION

## 3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and conforming to construction tolerance given in TABLE 1. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, the forms shall fit over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

# 3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

## 3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing

concrete, except that in cold weather with probable freezing temperatures, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

### 3.4 REMOVAL OF FORMS

Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

#### TABLE 1

## TOLERANCES FOR FORMED SURFACES

1.	Var	iations from the plumb:	In any 3 m of length 6 mm
	a.	In the lines and surfaces of columns, piers, walls and in arises	Maximum for entire length 25 mm
	b.	For exposed corner columns, control-joint grooves, and other conspicuous lines	In any 6 m of length 6 mm  Maximum for entire length 13 mm
2.	lev gra	iation from the el or from the des indicated on drawings:	In any 3 m of length 6 mm In any bay or in any 6 m of length 10 mm
	a.	In slab soffits, ceilings beam soffits, and in arises, measured	Maximum for entire length - 20 mm

b. In exposed lintels, sills,parapets, horizontal grooves, and other conspicuous

before removal of supporting shores

In any bay or in any 6 m of
length ----- 6 mm
Maximum for entire length - 13 mm

## TABLE 1

# TOLERANCES FOR FORMED SURFACES

# lines

3.	lin lin	iation of the ear building es from established ition in plan	In any 6 m 13 mm Maximum 25 mm
4.	bet	iation of distance ween walls, columns, titions	6 mm per 3 m of distance, but not more than 13 mm in any one bay, and not more than 25 mm total variation
5.	and sle	iation in the sizes locations of eves, floor openings, wall opening	Minus 6 mm Plus 13 mm
6.	cro dim and thi	iation in ss-sectional ensions of columns beams and in the ckness of slabs walls	Minus 6 mm Plus 13 mm
7.	Foo	tings:	
	a.	Variation of dimensions in plan	Minus 13 mm Plus 50 mm when formed or plus 75 mm when placed against unformed excavation
	b.	Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than 50 mm
	c.	Reduction in thickness	Minus 5 percent of specified thickness
8.	Var	iation in steps:	Riser 3 mm
	a.	In a flight of stairs	Tread 6 mm
	b.	In consecutive steps	Riser 2 mm Tread 3 mm
-	– En	d of Section	

# SECTION 03150

# EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS 05/98

# PART 1 GENERAL

# 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

# AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA ANSI/AHA A135.4 (1995) Basic Hardboard

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 919	(1984; R 1998) Use of Sealants in Acoustical Applications
ASTM C 920	(1998) Elastomeric Joint Sealants
ASTM D 1190	(1997) Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D 1191	(1984; R 1994el)

	Concrete Joint Sealers
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996el) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 1854	(1996) Jet-Fuel-Resistant Concrete Joint Sealer, Hot-Poured Elastic Type
ASTM D 2628	(1991; R 1998) Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D 2835	(1989; R 1998) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D 5249	(1995) Backer Material for Use With Cold and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Preformed Expansion Joint Filler; G-RE. Sealant; G-RE.

Manufacturer's literature, including safety data sheets, for preformed fillers and the lubricants used in their installation; field-molded sealants and primers (when required by sealant manufacturer); preformed compression seals; and waterstops.

SD-08 Manufacturer's Instructions

Preformed Expansion Joint Filler; Sealant; .

Manufacturer's recommended instructions for installing preformed fillers, field-molded sealants; preformed compression seals; and waterstops; and for splicing non-metallic waterstops.

SD-07 Certificates

Preformed Expansion Joint Filler; Sealant;

Certificates of compliance stating that the joint filler and sealant materials and waterstops conform to the requirements specified.

SD-04 Samples

Preformed Compression Seals and Lubricants;

Specimens identified to indicate the manufacturer, type of material, size and quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 3 m of 25 mm nominal width or wider seal or a piece not less than 4 m of compression seal less than 25 mm nominal width. One liter of lubricant shall be provided.

Field-Molded Type; .

Four liters of field-molded sealant and one liter of primer (when primer is recommended by the sealant manufacturer) identified to indicate manufacturer, type of material, quantity, and shipment or lot represented.

Non-metallic Materials; .

Specimens identified to indicate manufacturer, type of material, size, quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 300 mm long cut from each 61 m of finished waterstop furnished, but not less than a total of 1 m of each type, size, and lot furnished. One splice sample of each size and type for every 50 splices made in the factory and every 10 splices made at the job site. The splice samples shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each splice shall be not less than 300 mm long.

## 1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

# PART 2 PRODUCTS

# 2.1 CONTRACTION JOINT STRIPS

Contraction joint strips shall be 3 mm (1/8 inch) thick tempered hardboard conforming to AHA ANSI/AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

# 2.2 PREFORMED EXPANSION JOINT FILLER

Expansion joint filler shall be preformed material conforming to ASTM D 1751 or ASTM D 1752. Unless otherwise indicated, filler material shall be 10 mm (3/8 inch) thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

# 2.3 SEALANT

Joint sealant shall conform to the following:

# 2.3.1 Preformed Polychloroprene Elastomeric Type

ASTM D 2628.

2.3.2 Lubricant for Preformed Compression Seals

ASTM D 2835.

# 2.3.3 Hot-Poured Type

ASTM D 1190 tested in accordance with ASTM D 1191.

## 2.3.4 Field Molded Type

ASTM C 920, Type M for horizontal joints or Type NS for vertical joints, Class 25, and Use NT. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, non-shrink, nonreactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

## 2.3.5 Hot-Applied Jet-Fuel Resistant Type

ASTM D 1854 tested in accordance with ASTM D 1855.

### PART 3 EXECUTION

### 3.1 JOINTS

Joints shall be installed at locations indicated and as authorized.

## 3.1.1 Contraction Joints

Contraction joints may be constructed by cutting the concrete with a saw after concrete has set. Joints shall be approximately 3 mm wide and shall extend into the slab one-fourth the slab thickness, minimum, but not less than 25 mm .

## 3.1.1.2 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

# 3.1.2 Expansion Joints

Preformed expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 3 mm (1/8 inch) radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed and oiled wood strip temporarily secured to the top to form a recess to the size shown on the

drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

### 3.1.3 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

# 3.1.3.1 Joints With Preformed Compression Seals

Compression seals shall be installed with equipment capable of installing joint seals to the prescribed depth without cutting, nicking, twisting, or otherwise distorting or damaging the seal or concrete and with no more than 5 percent stretching of the seal. The sides of the joint and, if necessary, the sides of the compression seal shall be covered with a coating of lubricant. Butt joints shall be coated with liberal applications of lubricant.

## 3.1.3.2 Joints With Field-Molded Sealant

Joints shall not be sealed when the sealant material, ambient air, or concrete temperature is less than 4 degrees C . When the sealants are meant to reduce the sound transmission characteristics of interior walls, ceilings, and floors the guidance provided in ASTM C 919 shall be followed. Joints requiring a bond breaker shall be coated with curing compound or with bituminous paint. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

# 3.3 CONSTRUCTION JOINTS

Construction joints are specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

-- End of Section --

# SECTION 03200

# CONCRETE REINFORCEMENT 09/97

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

### ACI INTERNATIONAL (ACI)

ACI 318M (1995) Building Code Requirements for Structural Concrete and Commentary (Metric)

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1999) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 82	(1997a) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 184/A 184M	(1996) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 675/A 675M	(1990a; R 1995el) Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
ASTM A 706/A 706M	(1998) Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 767/A 767M	(1997) Zinc-Coated (Galvanized) Steel Bars in Concrete Reinforcement
ASTM A 775/A 775M	(1997el) Epoxy-Coated Reinforcement Steel Bars
ASTM A 884/A 884M	(1996ael) Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement

# AMERICAN WELDING SOCIETY (AWS)

AWS D1.4 (1992) Structural Welding Code - Reinforcing Steel

## CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI MSP-1

(1996) Manual of Standard Practice

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Concrete Reinforcement System; G-KC.

Complete shop drawings shall be submitted. The shop drawings shall be prepared under the direct supervision of a licensed professional engineer. The shop drawings shall contain his seal and a statement certifying that they are in compliance with the specifications and contract drawings. The shop drawing shall include details of the bending and placing schedule of the steel reinforcement, together with bar schedules indicating the number, size, dimensions, and total length of various bars required. Bar lists and bending diagrams shall be checked for accuracy and completeness before the bars are fabricated. Details of typical supports for reinforcing steel shall be approved prior to placing any concrete. Shop drawings shall show all concrete dimensions, location of all reinforcement, elevations, reinforcing steel clearances, and the location of all construction joints shown on the drawings or proposed by the Contractor. The drawings shall show support details including types, sizes and spacing. Spacing between vertical reinforcing steel shall be shown on the wall elevations. The minimum scale used in the shop drawings shall be 3/8-inch to the foot (1:50). Reinforcement bending details shall conform to the requirements of ACI SP-66.

SD-08 Statements

Welding; G-RE.

A list of qualified welders names.

SD-07 Certificates

Reinforcing Steel; G-RE.

Certified copies of mill reports attesting that the reinforcing steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified herein, prior to the installation of reinforcing steel.

## 1.3 WELDING

Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

#### 1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

### PART 2 PRODUCTS

#### 2.1 DOWELS

Dowels shall conform to ASTM A 675/A 675M, Grade 80. Steel pipe conforming to ASTM A 53, Schedule 80, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

## 2.2 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184/A 184M.

### 2.3 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M or ASTM A 706/A 706M, grades and sizes as indicated. Cold drawn wire used for spiral reinforcement shall conform to ASTM A 82. In highly corrosive environments or when directed by the Contracting Officer, reinforcing steel shall conform to ASTM A 767/A 767M or ASTM A 775/A 775M as appropriate.

### 2.3.1 Contingency

The Contractor shall add 5% contingency of the total weight of the reinforcing steel to account for omissions in the contract drawings.

## 2.4 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185 . When directed by the Contracting Officer for special applications, welded wire fabric shall conform to ASTM A 884/A 884M.

# 2.5 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

## 2.6 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 100 by 100 mm when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 13 mm of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

## PART 3 EXECUTION

# 3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318M. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

### 3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete.

Reinforcement shall be placed in accordance with ACI 318M at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318M. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

## 3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318M and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical or welded butt connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall conform to AWS D1.4. Welded butt splices shall be full penetration butt welds. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 150 mm. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before butt splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be butt spliced in a straight line.

# 3.2 WELDED-WIRE FABRIC PLACEMENT

Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 50 mm. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 1.2 m. Fabric shall be positioned by the use of supports.

# 3.3 DOWEL INSTALLATION

Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be coated with a bond breaker.

-- End of Section --

## SECTION 03300

# CAST-IN-PLACE STRUCTURAL CONCRETE 09/95

# PART 1 GENERAL

# 1.1 REFERENCES

ASTM C 1107

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

# ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 211.2	(1998) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 213R	(1987) Guide for Structural Lightweight Aggregate Concrete
ACI 214.3R	(1988; R 1997) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 305R	(1999) Hot Weather Concreting
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary
AMERICAN ASSOCIATION OF (AASHTO)	STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AASHTO M 182	(1991; R 1996) Burlap Cloth Made from Jute or Kenaf
AMERICAN SOCIETY FOR TE	STING AND MATERIALS (ASTM)
ASTM C 1059	(1999) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory

Evaluation

Grout(Nonshrink)

(1999) Packaged Dry, Hydraulic-Cement

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150	(1999a) Portland Cement
ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 173	(1994ael) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 231	(1997el) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 33	(1999ael) Concrete Aggregates
ASTM C 330	(2000) Lightweight Aggregates for Structural Concrete
ASTM C 552	(2000) Cellular Glass Thermal Insulation
ASTM C 567	(2000) Unit Weight of Structural Lightweight Concrete
ASTM C 578	(1995) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 591	(1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 78	(1994) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 940	(1998a) Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM E 96	(2000) Water Vapor Transmission of Materials
CORPS OF ENGINEERS (COE	
COE CRD-C 94	(1995) Surface Retarders
COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete

COE CRD-C 521

(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44

(1997) NIST Handbook 44: Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100

(1996) Concrete Plant Standards \\$n/c\$\X

NRMCA QC 3

(1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities

#### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Mixture Proportions; G-RE.

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of each strength or class of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

SD-06 Test Reports

Testing and Inspection for Contractor Quality Control; G-RE.

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compounds and concrete sealer proposed for use on this project.

SD-07 Certificates

Oualifications G-RE.

Written documentation for Contractor Quality Control personnel.

#### 1.3 OUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I Concrete Laboratory Testing Technician, Grade I or II Concrete Construction Inspector, Level II

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

#### 1.4 GENERAL REQUIREMENTS

#### 1.4.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

## 1.4.2 Strength Requirements

Normal weight structural concrete for all work shall have a 28-day compressive strength of 27.5 MPa. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39. Flexural strength shall be determined in accordance with ASTM C 78.

Lightweight concrete, if shown on the plans, shall meet the strength requirements of normal weight concrete, however, its dry unit weight shall not exceed  $1,762~{\rm Kg/m3}$ .

- a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (152 by 305 mm cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 3.5 MPa. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.
- b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 3.5 MPa or if tests of

field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.

- c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.
- d. Evaluation of Concrete Flexural Strength. Flexural strength specimens (beams) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31 and tested in accordance with ASTM C 78. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified flexural strength and no individual test result falls below the specified flexural strength by more than 350 kPa. A "test" is defined as the average of two companion beams. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the slab is considered potentially deficient.

# 1.4.3 Air Entrainment

All concrete shall be air entrained to contain between 4.5 and 7.5 percent total air. Air content for normal weight concrete shall be determined in accordance with ASTM C 231.

## 1.4.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143.

Structural Element	Minimum	Slump	Max:	imum
Walls, columns and beams	50 mm		100	mm
Foundation walls, substructure walls, footings, slabs	25 mm		75	mm
Any structural concrete approved for placement by pumping:				
Slabs	None		75	mm
Other than Slabs	None		125	mm

The slump and percent air of pumped concrete shall be determined at the outlet of the pump.

## 1.4.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 32 degrees C. When the ambient temperature during placing is 5 degrees C or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 12 and 25 degrees C.

## 1.4.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

#### 1.4.7 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

# 1.5 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

## 1.5.1 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Except as specified for flexural strength concrete, mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192 and tested in accordance with ASTM C 39. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air

content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in the paragraph Maximum Allowable w/c Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations in ACI 211.1 for the term P, which is used to denote the weight of pozzolan. If pozzolan is used, it shall be 20 percent by weight of the total cementitious material. Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

# 1.5.2 Proportioning Studies for Flexural Strength Concrete

Trial design batches, mixture proportioning studies, and testing requirements shall conform to the requirements specified in paragraph Proportioning Studies for Normal Weight Concrete, except that proportions shall be based on flexural strength as determined by test specimens (beams) fabricated in accordance with ASTM C 192 and tested in accordance with ASTM C 78. Procedures given in ACI 211.1 shall be modified as necessary to accommodate flexural strength.

# 1.5.3 Proportioning Studies for Lightweight Aggregate Structural Concrete

Trial design batches, mixture proportioning studies, and testing requirements shall conform to the requirements specified in paragraph Proportioning Studies for Normal Weight Concrete, except as follows. Trial mixtures having proportions, consistencies and air content suitable for the work shall be made based on methodology described in ACI 211.2, using at least three different cement contents. Trial mixes shall be proportioned to produce air dry unit weight and concrete strengths specified in paragraph GENERAL REQUIREMENTS. Trial mixtures shall be proportioned for maximum permitted slump and air content. Test specimens and testing shall be as specified for normal weight concrete except that 28-day compressive strength shall be determined from test cylinders that have been air dried at 50 percent relative humidity for the last 21 days. Air dry unit weight shall be determined in accordance with ASTM C 567 and shall be designed to be at least 32 kg per cubic meter less than the maximum specified air dry

unit weight in paragraph GENERAL REQUIREMENTS. Curves shall be plotted using these results showing the relationship between cement factor and strength and air dry unit weight. Normal weight fine aggregate may be substituted for part or all of the lightweight fine aggregate, provided the concrete meets the strength and unit weight. A correlation shall also be developed showing the ratio between air dry unit weight and fresh concrete unit weight for each mix.

# 1.5.4 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'cr) exceeding the specified compressive strength (f'c) by the amount indicated below. This required average compressive strength, f'cr, will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'cr during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'cr, the mixture shall be adjusted, as approved, to bring the daily average back up to f'cr. During production, the required f'cr shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

## 1.5.4.1 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'c) within 7 MPa of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'cr used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

f'cr = f'c + 1.34S where units are in MPa

f'cr = f'c + 2.33S - 3.45 where units are in MPa

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

	MODIFICATION FACTOR
NUMBER OF TESTS	FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

# 1.5.4.2 Computations without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'cr shall be determined as follows:

a. If the specified compressive strength f'c is less than 20 MPa,

f'cr = f'c + 6.9 MPa

b. If the specified compressive strength f'c is 20 to 35 MPa,

f'cr = f'c + 8.3 MPa

c. If the specified compressive strength f'c is over 35 MPa,

f'cr = f'c + 9.7 MPa

1.5.5 Average Flexural Strength Required for Mixtures

The mixture proportions selected during mixture design studies for flexural strength mixtures and the mixture used during concrete production shall be designed and adjusted during concrete production as approved, except that the overdesign for average flexural strength shall simply be 15 percent greater than the specified flexural strength at all times.

1.5.6 Mix Design for Bonded Topping for Heavy Duty Floors

The concrete mix design for bonded topping for heavy duty floors shall contain the greatest practical proportion of coarse aggregate within the specified proportion limits. The mix shall be designed to produce concrete having a 28-day strength of at least 34.5 MPa. Concrete for the topping shall consist of the following proportions, by weight:

- 1.00 part portland cement
- 1.15 to 1.25 parts fine aggregate
- 1.80 to 2.00 parts coarse aggregate

Maximum w/c shall be 0.33. The topping concrete shall not be air-entrained. The concrete shall be mixed so as to produce a mixture of the driest consistency possible to work with a sawing motion of the strike-off and which can be floated and compacted as specified without producing water or excess cement at the surface. In no case shall slump exceed 25 mm as determined by ASTM C 143.

## 1.6 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

#### 1.7 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer can and will inspect construction as considered appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

## 1.7.1 Inspection

Concrete operations may be tested and inspected by the Government as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered nor will it obligate the Government for final acceptance.

#### PART 2 PRODUCTS

#### 2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement, portland pozzolan cement, portland cement in combination with pozzolan or Ground Granulated Blast-Furnace slag and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

## 2.1.1 Portland Cement

ASTM C 150, Type I low alkali with a maximum 15 percent amount of tricalcium aluminate, or Type II, low alkali. White portland cement shall meet the above requirements except that it may be Type I, Type II or Type III low alkali. White Type III shall be used only in specific areas of the structure, when approved in writing.

# 2.2 AGGREGATES

Aggregates shall conform to the following.

# 2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

# 2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 4S. Maximum nominal aggregate size shall be 19 mm.

## 2.2.3 Lightweight Aggregate

Lightweight fine and coarse aggregate shall conform to the quality and gradation requirements of ASTM C 330, size 12/5 mm for coarse aggregate. Lightweight aggregate shall be similar to haydite expanded shale or approved equal. The aggregate shall be delivered to the site where the

concrete mixer is located, vacuum saturated, and kept moist until used.

#### 2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

# 2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

## 2.3.2 Accelerating Admixture

ASTM C 494, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

## 2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494, Type B, except that the 6-month and 1-year compressive and flexural strength tests are waived.

#### 2.4 CURING MATERIALS

#### 2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except that polyethylene sheet shall only be used for curing surfaces finished with a non-metallic light-reflective surface hardener as shown on the plans.

# 2.4.2 Membrane-Forming Compound

Membrane-Forming curing compound shall conform to ASTM C 309, Type 1-D or 2, except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Nonpigmented compound shall contain a fugitive dye, and shall have the reflective requirements in ASTM C 309 waived.

#### 2.4.3 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

#### 2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

# 2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107, Grade C, and shall be a commercial formulation suitable for the proposed application.

#### 2.7 NONSLIP SURFACING MATERIAL

Nonslip surfacing material shall consist of 55 percent, minimum, aluminum oxide or silicon-dioxide abrasive ceramically bonded together to form a homogeneous material sufficiently porous to provide a good bond with portland cement paste; or factory-graded emery aggregate consisting of not less than 45 percent aluminum oxide and 25 percent ferric oxide. The aggregate shall be well graded from particles retained on the 0.6 mm sieve to particles passing the 2.36 mm sieve.

#### 2.8 LATEX BONDING AGENT

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

#### 2.9 EPOXY RESIN

Epoxy resins for use in repairs shall conform to ASTM C 881, Type V, Grade 2. Class as appropriate to the existing ambient and surface temperatures.

#### 2.10 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Hangers for suspended ceilings shall be as specified in Section 09510 ACOUSTICAL CEILINGS. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

## 2.11 FLOOR HARDENER

Floor hardener shall be a colorless aqueous solution containing zinc silicofluoride, magnesium silicofluoride, or sodium silicofluoride. These silicofluorides can be used individually or in combination. Proprietary hardeners may be used if approved in writing by the Contracting Officer.

#### 2.12 PERIMETER INSULATION

Perimeter insulation shall be polystyrene conforming to ASTM C 578, Type II; polyurethane conforming to ASTM C 591, Type II; or cellular glass conforming to ASTM C 552, Type I or IV.

# 2.13 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 0.15 mm (6 mils) or other equivalent material having a vapor permeance rating not exceeding 30 nanograms per Pascal per second per square meter (0.5 perms) as determined in accordance with ASTM E 96.Text

# 2.14 CONCRETE SEALER

Where shown on the plans, concrete shall be sealed with a standard gray pigmented sealing system. A ready to use, single package, standard gray pigmented sealing system which is acceptable for use in "Super Seal Gray", manufactured by CONSPEC, or an approved equal manufacturer's product. The sealing system shall be applied according to the manufacturer's recommendations.

#### PART 3 EXECUTION

# 3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100 STRUCTURAL CONCRETE FORMWORK. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200 CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

#### 3.1.1 Foundations

## 3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

## 3.1.1.2 Preparation of Rock

Rock surfaces upon which concrete is to be placed shall be free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semidetached or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, as determined by the Contracting Officer, and to firm rock on the sides. Immediately before the concrete is placed, rock surfaces shall be cleaned thoroughly by the use of air-water jets or sandblasting as specified below for Previously Placed Concrete. Rock surfaces shall be kept continuously moist for at least 24 hours immediately prior to placing concrete thereon. All horizontal and approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar proportioned similar to that in the concrete mixture. Concrete shall be placed before the mortar stiffens.

## 3.1.2 Previously Placed Concrete

Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next horizontal lift by cleaning the construction joint surface with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Concrete at the side of vertical construction joints shall be prepared as approved by the Contracting Officer. Air-water cutting shall not be used on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean surfaces of well bonded coarse aggregate are exposed and make up at least 10-percent of the surface area, distributed uniformly throughout the surface. The edges of the coarse

aggregate shall not be undercut. The surface of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing fresh concrete. The surface shall be washed completely clean as the last operation prior to placing the next lift. For heavy duty floors and two-course floors a thin coat of neat cement grout of about the consistency of thick cream shall be thoroughly scrubbed into the existing surface immediately ahead of the topping placing. The grout shall be a 1:1 mixture of portland cement and sand passing the 2.36 mm sieve. The topping concrete shall be deposited before the grout coat has had time to stiffen.

## 3.1.2.1 Air-Water Cutting

Air-water cutting of a fresh concrete surface shall be performed at the proper time and only on horizontal construction joints. The air pressure used in the jet shall be 700 kPa plus or minus, 70 kPa, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Contracting Officer, a surface retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift in order to prolong the period of time during which air-water cutting is effective. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, high-pressure waterjet or sandblasting shall be used as the last operation before placing the next lift.

# 3.1.2.2 High-Pressure Water Jet

A stream of water under a pressure of not less than 20 MPa shall be used for cutting and cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the waterjet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

# 3.1.2.3 Wet Sandblasting

Wet sandblasting shall be used after the concrete has reached sufficient strength to prevent undercutting of the coarse aggregate particles. After wet sandblasting, the surface of the concrete shall then be washed thoroughly to remove all loose materials.

# 3.1.2.4 Waste Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.

# 3.1.2.5 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be thoroughly washed and shall be moist but without free water when concrete is placed.

#### 3.1.3 Vapor Barrier

Vapor barrier shall be provided beneath the interior on-grade concrete floor slabs. The greatest widths and lengths practicable shall be used to eliminate joints wherever possible. Joints shall be lapped a minimum of Torn, punctured, or damaged vapor barrier material shall be removed and new vapor barrier shall be provided prior to placing concrete. For minor repairs, patches may be made using laps of at least 300 mm. Lapped joints shall be sealed and edges patched with pressure-sensitive adhesive or tape not less than 50 mm wide and compatible with the membrane. Vapor barrier shall be placed directly on underlying subgrade, base course, or capillary water barrier, unless it consists of crushed material or large granular material which could puncture the vapor barrier. In this case, the surface shall be choked with a light layer of sand, as approved, before placing the vapor barrier. A 50 mm layer of compacted, clean concrete sand (fine aggregate) shall be placed on top of the vapor barrier before placing concrete. Concrete placement shall be controlled so as to prevent damage to the vapor barrier, or any covering sand.

#### 3.1.4 Perimeter Insulation

Perimeter insulation shall be installed at locations indicated. Adhesive shall be used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

#### 3.1.5 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 300 mm of the surface of the concrete. Tack welding shall not be performed on or to embedded items.

# 3.2 CONCRETE PRODUCTION

## 3.2.1 Batching, Mixing, and Transporting Concrete

Concrete shall either be batched and mixed onsite or shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating transporting units shall comply with NRMCA TMMB-01. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete. Site-mixed concrete shall conform to the following subparagraphs.

# 3.2.2 General

The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

# 3.2.3 Batching Equipment

The batching controls shall be semiautomatic or automatic, as defined in NRMCA CPMB 100. A semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. The weight of water and admixtures shall be recorded if batched by weight. Separate bins or compartments shall be provided for each size group of aggregate and type of cementitious material, to prevent intermingling at any time. Aggregates shall be weighed either in separate weigh batchers with individual scales or, provided the smallest size is batched first, cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cementitious material. If both portland cement and other cementitious material are used, they may be batched cumulatively, provided that the portland cement is batched first, except that silica fume shall always be batched separately. Water may be measured by weight or volume. Water shall not be weighed or measured cumulatively with another ingredient. Filling and discharging valves for the water metering or batching system shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. Piping for water and for admixtures shall be free from leaks and shall be properly valved to prevent backflow or siphoning. Admixtures shall be furnished as a liquid of suitable concentration for easy control of dispensing. An adjustable, accurate, mechanical device for measuring and dispensing each admixture shall be provided. Each admixture dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and individually discharged automatically in a manner to obtain uniform distribution throughout the water as it is added to the batch in the specified mixing period. When use of truck mixers makes this requirement impractical, the admixture dispensers shall be interlocked with the sand batchers. Different admixtures shall not be combined prior to introduction in water and shall not be allowed to intermingle until in contact with the cement. Admixture dispensers shall have suitable devices to detect and indicate flow during dispensing or have a means for visual observation. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment, and for sampling and calibrating the dispensing of cementitious material, water, and admixtures. Filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

## 3.2.4 Scales

The weighing equipment shall conform to the applicable requirements of CPMB Concrete Plant Standard, and of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. The tests shall be made at the specified frequency in the presence of a Government inspector. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

# 3.2.5 Batching Tolerances

(A) Tolerances with Weighing Equipment

# PERCENT OF REQUIRED WEIGHT

MATERIAL

Cementitious materials 0 to plus 2
Aggregate plus or minus 2
Water plus or minus 1
Chemical admixture 0 to plus 6

# (B) Tolerances with Volumetric Equipment

For volumetric batching equipment used for water and admixtures, the following tolerances shall apply to the required volume of material being batched:

PERCENT OF REQUIRED

MATERIAL MATERIAL

Water: plus or minus 1 percent Chemical admixtures: 0 to plus 6 percent

#### 3.2.6 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the weights of the materials being batched.

# 3.2.7 Concrete Mixers

Mixers shall be stationary mixers or truck mixers. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

# 3.2.7.1 Stationary Mixers

Concrete plant mixers shall be drum-type mixers of tilting, nontilting, horizontal-shaft, or vertical-shaft type, or shall be pug mill type and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94 applicable to central-mixed concrete.

# 3.2.7.2 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it is possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed. Water shall not be added at the placing site unless specifically approved; and in no case shall it exceed the specified w/c. Any such water shall be injected at the base of the mixer, not at the discharge end.

#### 3.3 LIGHTWEIGHT AGGREGATE CONCRETE

In addition to the requirements specified for normal weight concrete, lightweight aggregate concrete shall conform to the following. The batching and mixing cycle shall be as directed based on written recommendations from the aggregate supplier which the Contractor shall furnish. Unless otherwise directed, the mixer shall be charged with approximately 2/3 of the total mixing water and all of the aggregate. This shall be mixed for at least 1-1/2 minutes in a stationary mixer or 15 revolutions at mixing speed in a truck mixer. The remaining ingredients shall then be added and mixing continued as specified for normal weight concrete. Lightweight aggregate concrete shall not be vibrated to the extent that large particles of aggregate float to the surface. During finishing, lightweight aggregate concrete shall not be worked to the extent that mortar is driven down and lightweight coarse aggregate appears at the surface. Lightweight aggregate concrete to be pumped shall have a cement content of at least 335 kg per cubic meter. A field trial run of lightweight aggregate concrete placement and finishing shall be made in accordance with ACI 213R.

#### 3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

#### 3.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 0.2 square meters. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 1.5 cubic meters shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

# 3.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

## 3.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Nonagitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete,

shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

# 3.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

# 3.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper, for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 900 mm. The belt speed shall be a minimum of 90 meters per minute and a maximum of 225 meters per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

## 3.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 100 mm. Aluminum pipe shall not be used.

#### 3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 30 degrees C, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

# 3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 1.5 meters except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not

more than 300 mm thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

# 3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 100 mm thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.6 mm, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 150 mm into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 100 mm and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

## 3.5.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 5 degrees C. The temperature of the concrete when placed shall be not less than 10 degrees C nor more than 25 degrees C. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494, Type C or E may be used, provided it contains no calcium chloride. Calcium chloride shall not be used.

## 3.5.4 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 30 degrees C, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 49 degrees C. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	33 C
40-60	30 C
Less than 40	27 C

# 3.5.5 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

## 3.6 JOINTS

Joints shall be located and constructed as indicated or approved. Joints not indicated on the drawings shall be located and constructed to minimize the impact on the strength of the structure. In general, such joints shall be located near the middle of the spans of supported slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs, unless otherwise approved. Joints shall be perpendicular to the main reinforcement. All reinforcement shall be continued across joints; except that reinforcement or other fixed metal items shall not be continuous through expansion joints, or through construction or contraction joints in slabs on grade. Reinforcement shall be 50 mm clear from each joint. Except where otherwise indicated, construction joints between interior slabs on grade and vertical surfaces shall consist of 1.5 kg per square

meter asphalt-saturated felt, extending for the full depth of the slab. The perimeters of the slabs shall be free of fins, rough edges, spalling, or other unsightly appearance. Reservoir for sealant for construction and contraction joints in slabs shall be formed to the dimensions shown on the drawings by removing snap-out joint-forming inserts, by sawing sawable inserts, or by sawing to widen the top portion of sawed joints. Joints to be sealed shall be cleaned and sealed as indicated and in accordance with Section 07900 JOINT SEALING.

## 3.6.1 Construction Joints

For concrete other than slabs on grade, construction joints shall be located as shown on the drawings. Concrete shall be placed continuously so that each unit is monolithic in construction. Fresh concrete shall not be placed against adjacent hardened concrete until it is at least 24 hours old. Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete begins to lose its plasticity, before placing concrete for beams, girders, or slabs thereon. In walls having door or window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints in walls or columns are required, a strip of 25 mm square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 25 mm above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph Previously Placed Concrete.

#### 3.6.2 Contraction Joints in Slabs on Grade

Contraction joints shall be located and detailed as shown on the drawings. Contraction Joints shall be produced by forming a weakened plane in the concrete slab by use of rigid inserts impressed in the concrete during placing operations, use of snap-out plastic joint forming inserts, or sawing a continuous slot with a concrete saw. Regardless of method used to produce the weakened plane, it shall be 1/4 the depth of the slab thickness and between 3 and 5 mm wide. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent ravelling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

# 3.6.3 Expansion Joints

Installation of expansion joints and sealing of these joints shall conform to the requirements of Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS and Section 07900 JOINT SEALING.

#### 3.6.4 Waterstops

Waterstops shall be installed in conformance with the locations and details shown on the drawings using materials and procedures specified in Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS.

## 3.6.5 Dowels and Tie Bars

Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200 CONCRETE REINFORCEMENT and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1 mm in 100 mm. "Structural" type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

#### 3.7 FINISHING FORMED SURFACES

Forms, form materials, and form construction are specified in Section 03100 STRUCTURAL CONCRETE FORMWORK. Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract and, for Class A and B Finishes, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

# 3.7.2 Class D Finish

Class D finish is required for walls and foundation surfaces against which backfill will be placed. Fins, ravelings, and loose material shall be removed, and, except as otherwise indicated or as specified in Section 03100 STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Honeycomb and other defects more than 12 mm deep or more than 50 mm in diameter shall be repaired. Defects more than 50 mm in diameter shall be cut back to sound concrete, but in all cases at least 25 mm deep.

#### 3.8 REPAIRS

## 3.8.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 100 mm shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the 1.18 mm sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

#### 3.8.2 Repair of Major Defects

Major defects will be considered to be those more than 12 mm deep or, for Class A and B finishes, more than 12 mm in diameter and, for Class C and D finishes, more than 50 mm in diameter. Also included are any defects of any kind whose depth is over 100 mm or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

# 3.8.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 50 mm on all sides. All such defective areas greater than 7800 square mm shall be outlined by saw cuts at least 25  $\,$  mm  $\,$  deep. Defective areas less than 7800 square  $\,$  mm  $\,$  shall be outlined by a 25 mm deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed

and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

# 3.8.2.2 Repair of Deep and Large Defects

Deep and large defects will be those that are more than 150 mm deep and also have an average diameter at the surface more than  $450~\mathrm{mm}$  or that are otherwise so identified by the Project Office. Such defects shall be repaired as specified herein or directed, except that defects which affect the strength of the structure shall not be repaired and that portion of the structure shall be completely removed and replaced. Deep and large defects shall be repaired by procedures approved in advance including forming and placing special concrete using applied pressure during hardening. Preparation of the repair area shall be as specified for surface application of mortar. In addition, the top edge (surface) of the repair area shall be sloped at approximately 20 degrees from the horizontal, upward toward the side from which concrete will be placed. The special concrete shall be a concrete mixture with low water content and low slump, and shall be allowed to age 30 to 60 minutes before use. Concrete containing a specified expanding admixture may be used in lieu of the above mixture; the paste portion of such concrete mixture shall be designed to have an expansion between 2.0 and 4.0 percent when tested in accordance with ASTM C 940. A full width "chimney" shall be provided at the top of the form on the placing side to ensure filling to the top of the opening. A pressure cap shall be used on the concrete in the chimney with simultaneous tightening and revibrating the form during hardening to ensure a tight fit for the repair. The form shall be removed after 24 hours and immediately the chimney shall be carefully chipped away to avoid breaking concrete out of the repair; the surface of the repair concrete shall be dressed as required.

## 3.9 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

# 3.9.1 General

The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 10 degrees C. In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully

made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

## 3.9.2 Rough Slab Finish

As a first finishing operation for unformed surfaces and as final finish for slabs to receive mortar setting beds, the surface shall receive a rough slab finish prepared as follows. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

#### 3.9.3 Floated Finish

The screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. Then, after the concrete has stiffened so that it will withstand a man's weight without imprint of more than 6 mm and the water sheen has disappeared, it shall be floated to a true and even plane free of ridges. Floating shall be performed by use of suitable hand floats or power driven equipment. Sufficient pressure shall be used on the floats to bring a film of moisture to the surface. Hand floats shall be made of wood, magnesium, or aluminum. Lightweight concrete or concrete that exhibits stickiness shall be floated with a magnesium float. Care shall be taken to prevent over-finishing or incorporating water into the surface.

## 3.9.4 Troweled Finish

Except where otherwise specified, the concrete floor slabs shall have a troweled finish. After floating is complete and after the surface moisture has disappeared, unformed surfaces shall be steel-troweled to a smooth, even, dense finish, free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. Additional trowelings shall be performed, either by hand or machine until the surface has been troweled at least two times, with waiting period between each. Care shall be taken to prevent blistering and if such occurs, troweling shall immediately be stopped and operations and surfaces corrected. A final hard steel troweling shall be done by hand, with the trowel tipped, and using hard pressure, when the surface is at a point that the trowel will produce a ringing sound. The finished surface shall be thoroughly consolidated and shall be essentially free of trowel marks and be uniform

in texture and appearance. The concrete mixture used for troweled finished areas shall be adjusted, if necessary, in order to provide sufficient fines (cementitious material and fine sand) to finish properly.

## 3.10 FLOOR HARDENER

Non-metallic light-reflective surface hardener for hangar bay slabs shall conform to Section 03350 NON-METALLIC LIGHT-REFELECTIVE SURFACE-HARDENED CONCRETE FLOOR. Hardener shall be applied to all remaining interior concrete floors which do not receive a floor covering or are indicated as "CH" on the drawings. Floor hardener shall be applied after the concrete has been cured and then air dried for 28 days. Three coats shall be applied, each the day after the preceding coat was applied. For the first application, 0.5 kg of the silocofluoride shall be dissolved in 4 liters of water. For subsequent applications, the solution shall be 1.0 kg of silicofluoride to each 4 liters of water. Floor should be mopped with clear water shortly after the preceding application has dried to remove encrusted salts. Proprietary hardeners shall be applied in accordance with the manufacturer's instructions. During application, area should be well ventilated. Precautions shall be taken when applying silicofluorides due to the toxicity of the salts. Any compound that contacts glass or aluminum should be immediately removed with clear water.

#### 3.11 CURING AND PROTECTION

#### 3.11.1 General

Concrete shall be cured by an approved method for the period of time given below:

Concrete with Type III cement 3 days All other concrete 7 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Air and forms in contact with concrete shall be maintained at a temperature above 10 degrees C for the first 3 days and at a temperature above 0 degrees C for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds, moist curing shall be provided for any areas to receive floor hardener, any paint or other applied coating, or to which other concrete is to be bonded. Concrete containing silica fume shall be initially cured by fog misting during finishing, followed immediately by continuous moist curing. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

# 3.11.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be

permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, nonsupporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

# 3.11.3 Membrane Forming Curing Compounds

Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete, including surfaces to which a smooth finish is to be applied or other concrete to be bonded. However, a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements, may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. All surfaces shall be thoroughly moistened with water. Curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 500 kPa, at a uniform coverage of not more than 10 cubic meters per L for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. Surfaces on which clear compound is used shall be shaded from direct rays of the sun for the first 3 days. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

## 3.11.6 Cold Weather Curing and Protection

When the daily ambient low temperature is less than 0 degrees C the temperature of the concrete shall be maintained above 5 degrees C for the first seven days after placing. During the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 13 degrees C as determined by suitable temperature measuring devices furnished by the Government, as required, and installed adjacent to the concrete surface and 50 mm inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor as directed.

## 3.12 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where nonshrink grout is indicated. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 20 mm. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed. Nonshrink grout shall be used for column base plates and where indicated.

#### 3.12.1 Nonshrink Grout

Nonshrink grout shall be a ready-mixed material requiring only the addition of water. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

# 3.12.2 Mixing and Placing of Nonshrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified therein. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or machinery-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for completely retaining the grout on all sides and on top and shall be removed after the grout has set. The placed grout shall be carefully worked by rodding or other means to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 18 to 30 degrees C until after setting.

## 3.12.3 Treatment of Exposed Surfaces

For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 25 mm and immediately covered with a parge coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall have a smooth-dense finish and be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

## 3.13 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and thereafter for

conformance with ASTM C 1077.

## 3.13.1 Grading and Corrective Action

## 3.13.1.1 Fine Aggregate

At least once daily when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

## 3.13.1.2 Coarse Aggregate

At least once daily when the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

## 3.13.2 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

# 3.13.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor

shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

#### 3.13.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic meter, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic meter for each class of concrete batched during each day's plant operation.

## 3.13.5 Concrete Mixture

a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231 for normal weight concrete and ASTM C 173 for lightweight concrete. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph Air Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the air content at the mixer controlled

as directed.

- b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.
- Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 12.5 mm below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 50 mm. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.
- d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately

after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.

- e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064. The temperature shall be reported along with the compressive strength data.
- f. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 380 cubic meters or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. Test specimens shall be molded and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39 for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

# 3.13.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

#### 3.13.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to

improve temperature controls.

#### 3.13.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service and repaired or replaced.

## 3.13.9 Curing Inspection

- a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.
- c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square meters per Liter, and shall note whether or not coverage is uniform.
- d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
- f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

#### 3.13.10 Cold-Weather Protection

At least once each shift and once per day on non-work days, an inspection shall be made of all areas subject to cold-weather protection. Any

deficiencies shall be noted, corrected, and reported.

## 3.13.11 Mixer Uniformity

- a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 60,000 cubic meters of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94.
- b. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.
- c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

## 3.13.12 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

-- End of Section --

#### SECTION 03350

# NON-METALLIC LIGHT-REFLECTIVE SURFACE-HARDENED CONCRETE FLOOR 07/99

#### PART 1 GENERAL

#### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Certificate of Compliance; G-KC.

Prior to commencing construction of the reflective surface hardened floor, the Contractor shall submit to the Contracting Officer for approval, certification from the manufacturer that the proposed source of material conform to all requirements specified herein. Certification shall include name of manufacturer and supporting technical documentation that the reflective surface hardener and sodium silicate sealer meet the specification requirements. Reflective surface hardener and sealer shall not be delivered to the project until the Contracting Officer has approved, in writing, use of the proposed material. If the reflective surface hardeners and or sealer is rejected, it shall be the Con tractors responsibility to locate another source which is acceptable to the Contracting Officer at no additional cost to the Government.

SD-01 Preconstruction Submittals

Service Record; G-KC.

A service record from the manufacturer shall also be included with the certificate of compliance listing at least five projects where the proposed reflective surface hardener has been used and in service a minimum of 2 years in commercial or military aircraft hangars. -The-service record shall include location of facility, date of application, surface area and performance record.

## 1.3 GENERAL REQUIREMENTS

## 1.3.1 CONCRETE FLOOR SLABS

Concrete floors slabs in hangers, or as shown on the plans, shall have a non-metallic light-reflective surface floor hardener and a sodium silicate sealer conforming to the requirements specified herein. All other exposed concrete floor slabs shall receive a colorless, aqueous floor hardener applied as specified in paragraph: FLOOR HARDENER in SECTION: CAST-IN-PLACE STRUCTURAL CONCRETE, unless otherwise indicated.

# PART 2 PRODUCTS

#### 2.1 NON-METALLIC LIGHT-REFLECTIVE SURFACE FLOOR HARDENER

NON-METALLIC LIGHT-REFLECTIVE SURFACE FLOOR HARDENER shall be premixed, ready to use, dry shake, proportioned, mixed, packaged at the factory and delivered to the job site ready to apply, place, finish and cure. Manufacturer of light reflective surface hardeners shall own and control all phases of formulating, manufacturing, and packaging of the material. Manufacturer and applicator of the reflective surface hardener shall have at least 10 years experience in the manufacture of and application of light reflective floor hardener. Any light-reflective non-metallic surface floor hardener manufacturer that makes any disclaimer of the material's performance shall not be used. The light- reflective surface hardener shall be delivered packaged in sealed moisture-resistant bags.

# 2.1.1 Light-Reflective Surface Floor Hardener

The light-reflective surface floor hardener shall be white in color and provide a reflectivity from the finished floor of 50 percent. Reflectivity shall be determined in accordance with the requirements of LM-44, "IES Approved Method of Reflectometry of the Illuminating Engineering Society" except as modified herein. Magnesium oxide or barium sulfide shall be used for calibration. The refractometer shall conform to the requirements of LM-44.

#### 2.2 SODIUM SILICATE SEALER

SODIUM SILICATE SEALER shall be a colorless aqueous solution which when cured provides no discoloration of any type that reduces the reflectivity of the underlying reflective concrete surface. The sealer shall be a separate application to the completed non-metallic light-reflective surface hardened concrete floor. The sealer shall be compatible with the reflective surface hardener material. The sealer shall be delivered ready to use in the manufacturer's original containers. The sealant shall be approved by the manufacturer of the reflective surface hardener material.

# 2.2.1 Manufacturer of the sealant

Manufacturer of the sealant may be from the same source as the reflective surface hardener material or from a proprietary source provided the material conforms to the properties specified herein and the manufacturer of the reflective surface hardener material approves the material. A sodium silicate sealer which is acceptable for use is "Eucolsil" manufactured by The Euclid Chemical Company or an approved equal manufacturer's product. Regardless of source, no material shall be furnished which is not acceptable to the manufacturer of the reflective surface hardener material. The material selected shall have a three year service record of use on reflective surface hardened floors.

# 2.3 CONCRETE

Concrete shall conform to the requirements specified in SECTION: CAST-IN-PLACE STRUCTURAL CONCRETE, except as otherwise stated herein.

# 2.3.1 Slump

The maximum slump shall be 3 inches.

#### 2.3.2 Admixtures

Concrete shall be non-air-entrained. Maximum total air content shall not exceed 3 percent. Calcium chloride or set accelerating admixture containing calcium chloride shall not be used. Admixtures that increase bleeding shall not be used.

# 2.3.3 Placement

Concrete shall be placed with a minimum of handling in accordances with SECTION: CAST-IN-PLACE STRUCTURAL CONCRETE. Vibrators, when used, shall be inserted and withdrawn vertically. Concrete shall be struck to specified level with wooden strike-off bar. Concrete shall be further leveled and consolidated with wood bull float or wood derby before free moisture rises to the surface. Floating shall begin adjacent to forms and walls.

# PART 3 EXECUTION

#### 3.1 APPLICATION OF REFLECTIVE SURFACE HARDENERS AND SEALER

# 3.1.1 REFLECTIVE SURFACE HARDENER

The reflective surface hardener shall be applied in a two-stage application. Total application shall be at the rate recommended by the manufacturer but at a rate not less than 1.5 psf. The first application shall be at the rate of two-thirds of the total applied immediately following floating of total area. The shake shall first be applied to the floated concrete adjacent to forms, entryways, columns, and walls where moisture will be lost first. Hardener shall be distributed evenly. The material shall not be thrown on the surface. Finishing machines with float shoes shall be used as soon as shake has absorbed moisture (indicated by darkening of surface). Float just sufficiently to bring moisture from base slab through the shake. Excessive floating will discolor the concrete surface. This may be cause for the Contracting Officer to reject the completed surface hardened floor. Immediately following floating of the first shake, apply the remaining one-third of the total specified shake in the same manner and machine float as specified. Additional floating and finishing shall be by hand. No power equipment shall be allowed for final finishing. At no time shall water be added to the surface. As surface further stiffens, indicated by loss of sheen, it shall be hand troweled

#### 3.1.2 SEALER

The sealer shall be applied in strict accordance with the manufacture's instructions. The sealer shall be applied as soon as possible without damaging the finished concrete surface. The Contractor shall apply the sealer to the sample panel for final acceptance on the completed floor. Failure of the sealer to conform to the requirements specified herein shall be reason for the Contracting Officer to reject the sealer, application procedures, or both. It shall be the Contractor's responsibility to obtain another source of material or correct application procedures for obtaining a satisfactory end product.

# 3.2 CURING AND PROTECTION

Floors finished with non-metallic light-reflective surface hardener shall be cured by covering the sealed surface with polyethylene film unless otherwise approved. The polyethylene shall be placed as soon as possible after application of the sealer without damaging the concrete surface. The polyethylene shall remain on the floor for a minimum of 21 days. The floor shall be kept free of traffic and loads at least 10 days after completion. Additional covering shall be applied to the floor as required to protect the surface from construction activities. Adequate provision shall be made for maintaining the concrete temperature at 50 degrees F (10 degrees C) or above during the curing period.

#### 3.3 SAMPLE TEST AREA

The Contractor shall construct a sample test area at a location designated by the Contracting Officer. Test area shall be a minimum of 200 square feet. Test area shall be constructed and approved prior to commencing full production operations involving placing of concrete with the light reflective surface hardener and sealer. Concrete, including light reflective surface hardener and sealer, shall be of the same mix design and materials to be placed, consolidated, finisher, and cured during full production operations. Color, texture, and installation procedures shall be approved by the Contracting Officer and shall be the same procedures that will be maintained throughout the job. Reflectivity of the test section shall conform to the requirements specified herein. Failure of sample test section to meet the reflectivity requirements shall be just reason to reject the material.

# 3.4 CONSTRUCTION CONFORMANCE

The completed non-metallic light-reflective surface hardened concrete floor including the sealer shall be uniform in color and shall meet all requirements specified within this section. The Contractor is responsible for coordinating all disciplines including acceptance of materials and having a manufacture's representative on site for the test section as needed during concrete placement. The final product is the Contractor's responsibility. The completed floor surface is subject to approval of the Contracting Officer. Areas that are non-uniform or do not conform to specification requirements shall be corrected as directed by the Contracting Officer. Reflectivity shall conform to the requirements specified in Paragraph: Materials. The Contracting Officer shall select a minimum of three locations in the completed structure and the Contractor shall conduct a reflectivity test. Failure of the reflectivity test shall be cause to require a credit to the government or for removal and replacement of the inferior surface at no additional cost to the government.

# 3.5 MANUFACTURER'S REPRESENTATIVE

The manufacturer of the reflective surface hardener shall supply a full-time qualified technical representative familiar with the design and adjusting of concrete mix and incorporation of the shake to ensure proper application of the system. The manufacturer's representative shall be

available for consultation prior to placing the surface hardener and shall be on-site for construction of the sample test section and full scale application of the surface hardener on the floor. The representative shall be furnished at no additional cost to the Government. Coordinating for the services of the manufacture's representative shall be the Contractor's responsibility.

-- End of Section --

DIVISION 4 - MASONRY

THRU

DIVISION 12 - FURNISHINGS

NOT APPLICABLE

# DIVISION 13 - SPECIAL CONSTRUCTION

13280	Asbesto	s Aba	tements	
13281	Lead Ha	zard	Control	Activities

# SECTION 13280A

# ASBESTOS ABATEMENT 11/01

# PART 1 GENERAL

# 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

# AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z8	7.1				la) Occupational and Face Protection
ANSI Z8	8.2		(1992)	Respiratory	Protection
ANSI Z9	. 2		•	and Operation	damentals Governing the on of Local Exhaust
	AMERICAN	SOCIETY FOR	R TESTING A	ND MATERIALS	(ASTM)

AMERICAN	SOCIETY FOR TE	STING AND MATERIALS (ASTM)
ASTM C 732		(1995) Aging Effects of Artificial Weathering on Latex Sealants
ASTM D 1331		(1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents
ASTM D 2794		(1993; R 1999el) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 4397		(1996) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM D 522		(1993a) Mandrel Bend Test of Attached Organic Coatings
ASTM E 119		(2000) Fire Tests of Building Construction and Materials
ASTM E 1368		(2000) Visual Inspection of Asbestos Abatement Projects
ASTM E 736		(1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E 84		(2000a) Surface Burning Characteristics of Building Materials

ASTM E 96 (2000) Water Vapor Transmission of Materials

# COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7 (1990) Compressed Air for Human Respiration

CGA G-7.1 (1997) Commodity Specification for Air

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (1999) Methods of Fire Tests for Flame-Resistant Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 84-100 (1984; Supple 1985, 1987, 1988 & 1990) NIOSH Manual of Analytical Methods

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

# U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90/018 (1990) Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance EPA 340/1-90/019 (1990) Asbestos/NESHAP Adequately Wet Guidance EPA 560/5-85-024 (1985) Guidance for Controlling

Asbestos-Containing Materials in Buildings

# U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

Occupational Safety and Health Standards 29 CFR 1910 29 CFR 1926 Safety and Health Regulations for Construction 40 CFR 61 National Emission Standards for Hazardous Air Pollutants 40 CFR 763 Asbestos 42 CFR 84 Approval of Respiratory Protective Devices

49 CFR 107 Hazardous Materials Program Procedures

49 CFR 171 General Information, Regulations, and Definitions

49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements 49 CFR 173

Shippers - General Requirements for Shipments and Packagings

#### UNDERWRITERS LABORATORIES (UL)

UL 586

(1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

#### 1.2 DEFINITIONS

- a. Adequately Wet: A term defined in 40 CFR 61, Subpart M, and EPA 340/1-90/019 meaning to sufficiently mix or penetrate with liquid to prevent the release of particulate. If visible emissions are observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wetted.
- b. Aggressive Method: Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact asbestos-containing material (ACM).
- c. Amended Water: Water containing a wetting agent or surfactant with a surface tension of at least 29 dynes per square centimeter when tested in accordance with ASTM D 1331.
- d. Asbestos: Asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophylite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.
- e. Asbestos-Containing Material (ACM): Any materials containing more than one percent asbestos.
- f. Asbestos Fiber: A particulate form of asbestos, 5 micrometers or longer, with a length-to-width ratio of at least 3 to 1.
- g. Authorized Person: Any person authorized by the Contractor and required by work duties to be present in the regulated areas.
- h. Building Inspector: Individual who inspects buildings for asbestos and has EPA Model Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- i. Certified Industrial Hygienist (CIH): An Industrial Hygienist certified in the practice of industrial hygiene by the American Board of Industrial Hygiene.
- j. Class I Asbestos Work: Activities defined by OSHA involving the removal of thermal system insulation (TSI) and surfacing ACM.
- k. Class II Asbestos Work: Activities defined by OSHA involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos - containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and

- cements when they are still intact are excluded from Class II asbestos work. Removal of small amounts of these materials which would fit into a glovebag may be classified as a Class III job.
- 1. Class III Asbestos Work: Activities defined by OSHA that involve repair and maintenance operations, where ACM, including TSI and surfacing ACM, is likely to be disturbed. Operations may include drilling, abrading, cutting a hole, cable pulling, crawling through tunnels or attics and spaces above the ceiling, where asbestos is actively disturbed or asbestos-containing debris is actively disturbed.
- m. Class IV Asbestos Work: Maintenance and custodial construction activities during which employees contact but do not disturb ACM and activities to clean-up dust, waste and debris resulting from Class I, II, and III activities. This may include dusting surfaces where ACM waste and debris and accompanying dust exists and cleaning up loose ACM debris from TSI or surfacing ACM following construction.
- n. Clean room: An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
- o. Competent Person: In addition to the definition in 29 CFR 1926, Section .32(f), a person who is capable of identifying existing asbestos hazards as defined in 29 CFR 1926, Section .1101, selecting the appropriate control strategy, has the authority to take prompt corrective measures to eliminate them and has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- p. Contractor/Supervisor: Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- q. Critical Barrier: One or more layers of plastic sealed over all openings into a regulated area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a regulated area from migrating to an adjacent area.
- r. Decontamination Area: An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.
- s. Demolition: The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.
- t. Disposal Bag: A 0.15 mm thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926, Section .1101, used for transporting asbestos waste from containment to disposal site.
- u. Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater

- than the amount which can be contained in 1 standard sized glovebag or waste bag, not larger than 1.5 m in length and width in order to access a building component.
- v. Equipment Room or Area: An area adjacent to the regulated area used for the decontamination of employees and their equipment.
- w. Employee Exposure: That exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.
- x. Fiber: A fibrous particulate, 5 micrometers or longer, with a length to width ratio of at least 3 to 1.
- y. Friable ACM: A term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent, as determined by a method other than point counting by PLM, the asbestos content is verified by point counting using PLM.
- z. Glovebag: Not more than a 1.5 by 1.5 m impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.
- aa. High-Efficiency Particulate Air (HEPA) Filter: A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.
- bb. Homogeneous Area: An area of surfacing material or thermal system insulation that is uniform in color and texture.
- cc. Industrial Hygienist: A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards.
- dd. Intact: ACM which has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix. Removal of "intact" asphaltic, resinous, cementitious products does not render the ACM non-intact simply by being separated into smaller pieces.
- ee. Model Accreditation Plan (MAP): USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763, Subpart E, Appendix C.
- ff. Modification: A changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system.
- gg. Negative Exposure Assessment: A demonstration by the Contractor to show that employee exposure during an operation is expected to be consistently below the OSHA Permissible Exposure Limits (PELs).
- hh. NESHAP: National Emission Standards for Hazardous Air Pollutants.

The USEPA NESHAP regulation for asbestos is at 40 CFR 61, Subpart  $\mathbf{M}$ .

- ii. Nonfriable ACM: A NESHAP term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material containing more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.
- jj. Nonfriable ACM (Category I): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.
- kk. Nonfriable ACM (Category II): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos, as determined using the methods specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy, that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- ll. Permissible Exposure Limits (PELs):
  - (1) PEL-Time weighted average(TWA): Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8 hour time weighted average (TWA), as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.
  - (2) PEL-Excursion Limit: An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.
- mm. Regulated Area: An OSHA term defined in 29 CFR 1926, Section .1101 meaning an area established by the Contractor to demarcate areas where Class I, II, and III asbestos work is conducted; also any adjoining area where debris and waste from such asbestos work accumulate; and an area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.
- nn. Removal: All operations where ACM is taken out or stripped from structures or substrates, and includes demolition operations.
- oo. Repair: Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM attached to structures or substrates. If the amount of asbestos so "disturbed" cannot be contained in 1 standard glovebag or waste bag, Class I precautions are required.
- pp. Spills/Emergency Cleanups: Cleanup of sizable amounts of asbestos
   waste and debris which has occurred, for example, when water

damage occurs in a building, and sizable amounts of ACM are dislodged. A Competent Person evaluates the site and ACM to be handled, and based on the type, condition and extent of the dislodged material, classifies the cleanup as Class I, II, or III. Only if the material was intact and the cleanup involves mere contact of ACM, rather than disturbance, could there be a Class IV classification.

- qq. Surfacing ACM: Asbestos-containing material which contains more than 1% asbestos and is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.
- rr. Thermal system insulation (TSI) ACM: ACM which contains more than 1% asbestos and is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation.
- ss. Transite: A generic name for asbestos cement wallboard and pipe.
- tt. Worker: Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926, Section .1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, if required by the OSHA Class of work to be performed or by the state where the work is to be performed.

# 1.3 DESCRIPTION OF WORK

The work covered by this section includes the removal of asbestos-containing materials (ACM) which are encountered during demolition and renovation activities associated with this project and describes procedures and equipment required to protect workers and occupants of the regulated area from contact with airborne asbestos fibers and ACM dust and debris. Activities include OSHA Class II work operations involving ACM. The work also includes containment, storage, transportation and disposal of the generated ACM wastes. More specific operational procedures shall be detailed in the required Accident Prevention Plan and its subcomponents, the Asbestos Hazard Abatement Plan and Activity Hazard Analyses required in paragraph SAFETY AND HEALTH PROGRAM AND PLANS.

#### 1.3.1 Abatement Work Tasks

The specific ACM to be abated is identified on Table 1, "Summary of Work Tasks". The appropriate RESPONSE ACTION DETAIL SHEETS (item to be abated and methods to be used) and SET-UP DETAIL SHEETS (containment techniques to include safety precautions and methods) are included at the end of this section.

# 1.3.2 Unexpected Discovery of Asbestos

For any previously untested building components suspected to contain asbestos and located in areas impacted by the work, the Contractor shall notify the Contracting Officer (CO) who will have the option of ordering up to 10 bulk samples to be obtained at the Contractor's expense and delivered to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program

(NVLAP)" and analyzed by PLM at no additional cost to the Government. Any additional components identified as ACM that have been approved by the Contracting Officer for removal shall be removed by the Contractor and will be paid for by an equitable adjustment to the contract price under the CONTRACT CLAUSE titled "changes". Sampling activities undertaken to determine the presence of additional ACM shall be conducted by personnel who have successfully completed the EPA Model Accreditation Plan (MAP) "Building Inspector" training course required by 40 CFR 763, Subpart E, Appendix C.

#### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

Respiratory Protection Program; G, AE

Records of the respirator program.

Cleanup and Disposal; G, AE

Waste shipment records. Weigh bills and delivery tickets shall be furnished for information only.

Detailed Drawings; G

Descriptions, detail project drawings, and site layout to include worksite containment area techniques as prescribed on applicable SET-UP DETAIL SHEETS, local exhaust ventilation system locations, decontamination units and load-out units, other temporary waste storage facility, access tunnels, location of temporary utilities (electrical, water, sewer) and boundaries of each regulated area.

Materials and Equipment;

Manufacturer's catalog data for all materials and equipment to be used in the work, including brand name, model, capacity, performance characteristics and any other pertinent information. Test results and certificates from the manufacturer of encapsulants substantiating compliance with performance requirements of this specification. Material Safety Data Sheets for all chemicals to be used onsite in the same format as implemented in the Contractor's HAZARD COMMUNICATION PROGRAM. Data shall include, but shall not be limited to, the following items:

- a. High Efficiency Filtered Air (HEPA) local exhaust equipment
- b. Vacuum cleaning equipment
- c. Pressure differential monitor for HEPA local exhaust equipment  $% \left( 1\right) =\left( 1\right) +\left( 1\right) +$

- d. Air monitoring equipment
- e. Respirators
- f. Personal protective clothing and equipment
  - (1) Coveralls
  - (2) Underclothing
  - (3) Other work clothing
  - (4) Foot coverings
  - (5) Hard hats
  - (6) Eye protection
- (7) Other items required and approved by Contractors Designated IH and Competent Person
  - g. Glovebag
  - h. Duct Tape
  - i. Disposal Containers
    - (1) Disposal bags
    - (2) Fiberboard drums
    - (3) Paperboard boxes
  - j. Sheet Plastic
    - (1) Polyethylene Sheet General
    - (2) Polyethylene Sheet Flame Resistant
    - (3) Polyethylene Sheet Reinforced
  - k. Wetting Agent
    - (1) Amended Water
    - (2) Removal encapsulant
  - 1. Strippable Coating
  - m. Prefabricated Decontamination Unit
  - n. Other items
  - o. Chemical encapsulant
  - p. Chemical encasement materials
  - q. Material Safety Data Sheets (for all chemicals proposed)

Qualifications; G, AE

A written report providing evidence of qualifications for personnel, facilities and equipment assigned to the work.

Training Program;

A copy of the written project site-specific training material as indicated in 29 CFR 1926, Section .1101 that will be used to train onsite employees. The training document shall be signed by the Contractor's Designated IH and Competent Person.

Medical Requirements;

Physician's written opinion.

Encapsulants; G, AE

Certificates stating that encapsulants meet the applicable specified performance requirements.

SD-06 Test Reports

Exposure Assessment and Air Monitoring; G, AE

Initial exposure assessments, negative exposure assessments, air-monitoring results and documentation.

Local Exhaust Ventilation;

Pressure differential recordings.

Licenses, Permits and Notifications; G, AE

Licenses, permits, and notifications.

SD-07 Certificates

Vacuum, Filtrationand Ventilation Equipment;

Manufacturer's certifications showing compliance with ANSI Z9.2 for:

- a. Vacuums.
- b. Water filtration equipment.
- c. Ventilation equipment.
- d. Other equipment required to contain airborne asbestos fibers.

#### 1.5 QUALIFICATIONS

# 1.5.1 Written Qualifications and Organization Report

The Contractor shall furnish a written qualifications and organization report providing evidence of qualifications of the Contractor, Contractor's Project Supervisor, Designated Competent Person, supervisors and workers; Designated IH (person assigned to project and firm name); independent testing laboratory (including name of firm, principal, and analysts who will perform analyses); all subcontractors to be used including disposal transportation and disposal facility firms, subcontractor supervisors, subcontractor workers; and any others assigned to perform asbestos abatement and support activities. The report shall include an organization chart showing the Contractor's staff organization for this project by name and title, chain of command and reporting relationship with all subcontractors. The report shall be signed by the Contractor, the Contractor's onsite project manager, Designated Competent Person, Designated IH, designated testing laboratory and the principals of all subcontractors to be used. The Contractor shall include the following

statement in the report: "By signing this report I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and the federal, state and local requirements specified in paragraph SAFETY AND HEALTH PROGRAM AND PLANS for those asbestos abatement activities that they will be involved in."

# 1.5.2 Specific Requirements

The Contractor shall designate in writing, personnel meeting the following qualifications:

- Designated Competent Person: The name, address, telephone number, and resume of the Contractor's Designated Competent Person shall be provided. Evidence that the full-time Designated Competent Person is qualified in accordance with 29 CFR 1926, Sections .32 and .1101, has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and is experienced in the administration and supervision of asbestos abatement projects, including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. The duties of the Competent Person shall include the following: controlling entry to and exit from the regulated area; supervising any employee exposure monitoring required by 29 CFR 1926, Section .1101; ensuring that all employees working within a regulated area wear the appropriate personal protective equipment (PPE), are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating conditions and are functioning properly. The Designated Competent Person shall be responsible for compliance with applicable federal, state and local requirements, the Contractor's Accident Prevention Plan and Asbestos Hazard Abatement Plan. The Designated Competent Person shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that this person has a minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA competent person requirements. The Designated Competent Person shall be onsite at all times during the conduct of this project.
- b. Project and Other Supervisors: The Contractor shall provide the name, address, telephone number, and resume of the Project Supervisor and other supervisors who have responsibility to implement the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses, the authority to direct work performed under this contract and verify compliance, and have EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C. The Project Supervisor and other

- supervisors shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that the Project Supervisor has a minimum of 2 years of on-the-job asbestos abatement experience relevant to project supervisor responsibilities and the other supervisors have a minimum of 1 year on-the-job asbestos abatement experience commensurate with the responsibilities they will have on this project.
- c. Designated Industrial Hygienist: The Contractor shall provide the name, address, telephone number, resume and other information specified below for the Industrial Hygienist (IH) selected to prepare the Contractor's Asbestos Hazard Abatement Plan, prepare and perform training, direct air monitoring and assist the Contractor's Competent Person in implementing and ensuring that safety and health requirements are complied with during the performance of all required work. The Designated IH shall be a person who is board certified in the practice of industrial hygiene as determined and documented by the American Board of Industrial Hygiene (ABIH), has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and has a minimum of 2 years of comprehensive experience in planning and overseeing asbestos abatement activities. The Designated IH shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Designated IH shall be completely independent from the Contractor according to federal, state, or local regulations; that is, shall not be a Contractor's employee or be an employee or principal of a firm in a business relationship with the Contractor negating such independent status. A copy of the Designated IH's current valid ABIH certification shall be included. The Designated IH shall visit the site at least once per week for the duration of asbestos activities and shall be available for emergencies. In addition, the Designated IH shall prepare, and the Contractor shall submit, the name, address, telephone numbers and resumes of additional IH's and industrial hygiene technicians (IHT) who will be assisting the Designated IH in performing onsite tasks. IHs and IHTs supporting the Designated IH shall have a minimum of 2 years of practical onsite asbestos abatement experience. The formal reporting relationship between the Designated IH and the support IHs and IHTs, the Designated Competent Person, and the Contractor shall be indicated.
- d. Asbestos Abatement Workers: Asbestos abatement workers shall meet the requirements contained in 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and other applicable federal, state and local requirements. Worker training documentation shall be provided as required on the "Certificate of Workers Acknowledgment" in this paragraph.
- e. Worker Training and Certification of Worker Acknowledgment:
  Training documentation will be required for each employee who will
  perform OSHA Class IIasbestos abatement operations. Such
  documentation shall be submitted on a Contractor generated form

titled "Certificate of Workers Acknowledgment", to be completed for each employee in the same format and containing the same information as the example certificate at the end of this section. Training course completion certificates (initial and most recent update refresher) required by the information checked on the form shall be attached.

- f. Physician: The Contractor shall provide the name, medical qualifications, address, telephone number and resume of the physician who will or has performed the medical examinations and evaluations of the persons who will conduct the asbestos abatement work tasks. The physician shall be currently licensed by the state where the workers will be or have been examined, have expertise in pneumoconiosis and shall be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1926, Section .1101 and paragraph MEDICAL REQUIREMENTS. The physician shall be familiar with the site's hazards and the scope of this project.
- g. First Aid and CPR Trained Persons: The names of at least 2 persons who are currently trained in first aid and CPR by the American Red Cross or other approved agency shall be designated and shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030 and shall be included in the Contractor's Bloodborne Pathogen Program. These persons may perform other duties but shall be immediately available to render first aid when needed. A copy of each designated person's current valid First Aid and CPR certificate shall be provided.
- h. Independent Testing Laboratory: The Contractor shall provide the name, address and telephone number of the independent testing laboratory selected to perform the sample analyses and report the results. The testing laboratory shall be completely independent from the Contractor as recognized by federal, state or local regulations. Written verification of the following criteria, signed by the testing laboratory principal and the Contractor, shall be submitted:
  - (1) Phase contrast microscopy (PCM): The laboratory is fully equipped and proficient in conducting PCM of airborne samples using the methods specified by 29 CFR 1926, Section .1101, OSHA method ID-160, the most current version of NIOSH Pub No. 84-100 Method 7400, and NIOSH Pub No. 84-100 Method 7402, transmission electron microscopy (TEM); the laboratory is currently judged proficient (classified as acceptable) in counting airborne asbestos samples by PCM by successful participation in each of the last 4 rounds in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program; the names of the selected microscopists who will analyze airborne samples by PCM with verified documentation of their proficiency to conduct PCM analyses by being judged proficient in counting samples as current participating analysts in the AIHA PAT Program, and having successfully completed the Asbestos Sampling and Analysis course (NIOSH 582 or equivalent) with a copy of course completion certificate provided; when the PCM analysis is to be conducted onsite, documentation shall be provided certifying that the onsite

analyst meets the same requirements.

- (2) Polarized light microscopy (PLM): The laboratory is fully equipped and proficient in conducting PLM analyses of suspect ACM bulk samples in accordance with 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for bulk asbestos analysis and will use analysts (names shall be provided) with demonstrated proficiency to conduct PLM to include its application to the identification and quantification of asbestos content.
- (3) PCM/TEM: The laboratory is fully equipped and each analyst (name shall be provided) possesses demonstrated proficiency in conducting PCM and TEM analysis of airborne samples using NIOSH Pub No. 84-100 Method 7400 PCM and NIOSH Pub No. 84-100 Method 7402 (TEM confirmation of asbestos content of PCM results) from the same filter.
- i. Disposal Facility, Transporter: The Contractor shall provide written evidence that the landfill to be used is approved for asbestos disposal by the USEPA and state and local regulatory agencies. Copies of signed agreements between the Contractor (including subcontractors and transporters) and the asbestos waste disposal facility to accept and dispose of all asbestos containing waste generated during the performance of this contract shall be provided. Qualifications shall be provided for each subcontractor or transporter to be used, indicating previous experience in transport and disposal of asbestos waste to include all required state and local waste hauler requirements for asbestos. The Contractor and transporters shall meet the DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and other applicable state or local requirements. The disposal facility shall meet the requirements of 40 CFR 61, Sections .154 or .155, as required in 40 CFR 61, Section .150(b), and other applicable state or local requirements.

# 1.5.3 Federal, State or Local Citations on Previous Projects

The Contractor and all subcontractors shall submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company shall be provided.

# 1.6 REGULATORY REQUIREMENTS

In addition to detailed requirements of this specification, work performed under this contract shall comply with EM 385-1-1, applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. This includes, but is not limited to, OSHA standards, 29 CFR 1926, especially Section .1101, 40 CFR 61, Subpart M and 40 CFR 763; and U.S. Department of Transportaion (DOT) regulations 49 CFR Part 171, 49 CFR Part 172, Subparts B and C, and 49 CFR Part 173, Subpart M. Matters of

interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply. The following state and local laws, rules and regulations regarding demolition, removal, renovation, spill/emergency cleanup, housekeeping, handling, storing, transporting and disposing of asbestos material apply: Missouri Department of Natural Resources, Air Pollution Control Program, 10 C.S.R. 10-6.240.

#### 1.7 SAFETY AND HEALTH PROGRAM AND PLANS

The Contractor shall develop and submit a written comprehensive site-specific Accident Prevention Plan at least 30 days prior to the preconstruction conference. The Accident Prevention Plan shall address requirements of EM 385-1-1, Appendix A, covering onsite work to be performed by the Contractor and subcontractors. The Accident Prevention Plan shall incorporate an Asbestos Hazard Abatement Plan, and Activity Hazard Analyses as separate appendices into 1 site specific Accident Prevention Plan document. Any portions of the Contractor's overall Safety and Health Program that are referenced in the Accident Prevention Plan, e.g., respirator program, hazard communication program, confined space entry program, etc., shall be included as appendices to the Accident Prevention Plan. The plan shall take into consideration all the individual asbestos abatement work tasks identified in Table 1. The plan shall be prepared, signed and sealed, including certification number, and dated by the Contractor's Designated IH, Competent Person, and Project Supervisor.

# 1.7.1 Asbestos Hazard Abatement Plan Appendix

The Asbestos Hazard Abatement Plan appendix to the Accident Prevention Plan shall include, but not be limited to, the following:

- a. The personal protective equipment to be used;
- b. The location and description of regulated areas including clean and dirty areas, access tunnels, and decontamination unit (clean room, shower room, equipment room, storage areas such as load-out unit);
- c. Initial exposure assessment in accordance with 29 CFR 1926, Section .1101;
- d. Level of supervision;
- e. Method of notification of other employers at the worksite;
- f. Abatement method to include containment and control procedures;
- g. Interface of trades involved in the construction;
- h. Sequencing of asbestos related work;
- i. Storage and disposal procedures and plan;
- j. Type of wetting agent and asbestos encapsulant to be used;
- k. Location of local exhaust equipment;

- 1. Air monitoring methods (personal, environmental and clearance);
- m. Bulk sampling and analytical methods (if required);
- n. A detailed description of the method to be employed in order to control the spread of ACM wastes and airborne fiber concentrations;
- o. Fire and medical emergency response procedures;
- p. The security procedures to be used for all regulated areas.

# 1.7.2 Activity Hazard Analyses Appendix

Activity Hazard Analyses, for each major phase of work, shall be submitted and updated during the project. The Activity Hazard Analyses format shall be in accordance with EM 385-1-1 (Figure 1-1). The analysis shall define the activities to be performed for a major phase of work, identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the Activity Hazard Analyses has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the onsite Government representatives. The Activity Hazard Analyses shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations.

#### 1.8 PRECONSTRUCTION CONFERENCE AND ONSITE SAFETY

The Contractor and the Contractor's Designated Competent Person, Project Supervisor, and Designated IH shall meet with the Contracting Officer prior to beginning work at a safety preconstruction conference to discuss the details of the Contractor's submitted Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses appendices. Deficiencies in the Accident Prevention Plan will be discussed and the Accident Prevention Plan shall be revised to correct the deficiencies and resubmitted for acceptance. Any changes required in the specification as a result of the Accident Prevention Plan shall be identified specifically in the plan to allow for free discussion and acceptance by the Contracting Officer, prior to the start of work. Onsite work shall not begin until the Accident Prevention Plan has been accepted. A copy of the written Accident Prevention Plan shall be maintained onsite. Changes and modifications to the accepted Accident Prevention Plan shall be made with the knowledge and concurrence of the Designated IH, the Project Supervisor, Designated Competent Person, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Designated IH shall bring such hazard to the attention of the Project Supervisor, Designated Competent Person, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Once accepted by the Contracting Officer, the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses will be enforced as if an addition to the contract. Disregarding the provisions of this contract or the accepted Accident Prevention Plan will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

# 1.9 SECURITY

Lockable access areas (personnel and load-out decontamination units) shall be provided for each regulated area. A log book shall be kept documenting entry into and out of the regulated area. Entry into regulated areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas shall be trained, be medically evaluated, and wear the required personal protective equipment for the specific regulated area to be entered.

#### 1.10 MEDICAL REQUIREMENTS

Medical requirements shall conform to 29 CFR 1926, Section .1101.

#### 1.10.1 Medical Examinations

Before being exposed to airborne asbestos fibers, workers shall be provided with a medical examination as required by 29 CFR 1926, Section .1101 and other pertinent state or local requirements. This requirement shall have been satisfied within the last 12 months. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. X-ray films of asbestos workers shall be identified to the consulting radiologist and medical record jackets shall be marked with the word "asbestos."

# 1.10.1.1 Information Provided to the Physician

The Contractor shall provide the following information in writing to the examining physician:

- a. A copy of 29 CFR 1926, Section .1101 and Appendices D, E, G, and I;
- b. A description of the affected employee's duties as they relate to the employee's exposure;
- c. The employee's representative exposure level or anticipated exposure level;
- d. A description of any personal protective and respiratory equipment used or to be used;
- e. Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

# 1.10.1.2 Written Medical Opinion

For each worker, a written medical opinion prepared and signed by a licensed physician indicating the following:

- a. Summary of the results of the examination.
- b. The potential for an existing physiological condition that would place the employee at an increased risk of health impairment from exposure to asbestos.
- c. The ability of the individual to wear personal protective equipment, including respirators, while performing strenuous work tasks under cold and/or heat stress conditions.

d. A statement that the employee has been informed of the results of the examination, provided with a copy of the results, informed of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure, and informed of any medical condition that may result from asbestos exposure.

# 1.10.2 Medical and Exposure Records

Complete and accurate records shall be maintained of each employee's medical examinations, medical records, and exposure data, as required by 29 CFR 1910, Section .1910.20 and 29 CFR 1926, Section .1101 for a period of 30 years after termination of employment. Records of the required medical examinations and exposure data shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health (OSHA) or authorized representatives of the employee and an employee's physician upon request of the employee or former employee. A copy of the required medical certification for each employee shall be maintained on file at the worksite for review, as requested by the Contracting Officer or the representatives.

#### 1.11 TRAINING PROGRAM

# 1.11.1 General Training Requirements

The Contractor shall establish a training program as specified by EPA Model Accreditation Plan (MAP), training requirements at 40 CFR 763, Subpart E, Appendix C, the State of Missouri regulation no. 10 CSR 10-6.250, OSHA requirements at 29 CFR 1926, Section .1101(k)(9), and this specification. Contractor employees shall complete the required training for the type of work they are to perform and such training shall be documented and provided to the Contracting Officer as specified in paragraph QUALIFICATIONS.

# 1.11.2 Project Specific Training

Prior to commencement of work, each worker shall be instructed by the Contractor's Designated IH and Competent Person in the following project specific training:

- The hazards and health effects of the specific types of ACM to be abated;
- b. The content and requirements of the Contractor's Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses and site-specific safety and health precautions;
- c. Hazard Communication Program;
- d. Hands-on training for each asbestos abatement technique to be employed;
- e. Heat and/or cold stress monitoring specific to this project;
- f. Air monitoring program and procedures;
- g. Medical surveillance to include medical and exposure record-keeping procedures;
- h. The association of cigarette smoke and asbestos-related disease;

- i. Security procedures;
- j. Specific work practice controls and engineering controls required for each Class of work in accordance with 29 CFR 1926, Section .1101.

#### 1.12 RESPIRATORY PROTECTION PROGRAM

The Contractor's Designated IH shall establish in writing, and implement a respiratory protection program in accordance with 29 CFR 1926, Section .1101, 29 CFR 1910, Section .134, ANSI Z88.2, CGA G-7, CGA G-7.1 and DETAIL SHEET 12. The Contractor's Designated IH shall establish minimum respiratory protection requirements based on measured or anticipated levels of airborne asbestos fiber concentrations encountered during the performance of the asbestos abatement work. The Contractor's respiratory protection program shall include, but not be limited to, the following elements:

- a. The company policy, used for the assignment of individual responsibility, accountability, and implementation of the respiratory protection program.
- b. The standard operating procedures covering the selection and use of respirators. Respiratory selection shall be determined by the hazard to which the worker is exposed.
- c. Medical evaluation of each user to verify that the worker may be assigned to an activity where respiratory protection is required.
- d. Training in the proper use and limitations of respirators.
- e. Respirator fit-testing, i.e., quantitative, qualitative and individual functional fit checks.
- f. Regular cleaning and disinfection of respirators.
- g. Routine inspection of respirators during cleaning and after each use when designated for emergency use.
- h. Storage of respirators in convenient, clean, and sanitary locations.
- i. Surveillance of regulated area conditions and degree of employee exposure (e.g., through air monitoring).
- j. Regular evaluation of the continued effectiveness of the respiratory protection program.
- k. Recognition and procedures for the resolution of special problems as they affect respirator use (e.g., no facial hair that comes between the respirator face piece and face or interferes with valve function; prescription eye wear usage; contact lenses usage; etc.).
- 1. Proper training in putting on and removing respirators.

# 1.12.1 Respiratory Fit Testing

A qualitative or quantitative fit test conforming to 29 CFR 1926, Section 1101, Appendix C shall be conducted by the Contractor's Designated IH for

each Contractor worker required to wear a respirator, and for the Contracting Officer and authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test shall be performed for each worker wearing a negative-pressure respirator prior to initially wearing a respirator on this project and every 6 months thereafter. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, or of full-facepiece air purifying respirators where they are worn at levels at which half-facepiece air purifying respirators are permitted. If physical changes develop that will affect the fit, a new fit test for the worker shall be performed. Functional fit checks shall be performed by employees each time a respirator is put on and in accordance with the manufacturer's recommendation.

# 1.12.2 Respirator Selection and Use Requirements

The Contractor shall provide respirators, and ensure that they are used as required by 29 CFR 1926, Section .1101 and in accordance with the manufacturer's recommendations. Respirators shall be jointly approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (MSHA/NIOSH), or by NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. Personnel who handle ACM, enter regulated areas that require the wearing of a respirator, or who are otherwise carrying out abatement activities that require the wearing of a respirator, shall be provided with approved respirators that are fully protective of the worker at the measured or anticipated airborne asbestos concentration level to be encountered. For air-purifying respirators, the particulate filter portion of the cartridges or canister approved for use in airborne asbestos environments shall be high-efficiency particulate air (HEPA). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type shall be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered. Recommendations made by the Contractor's Designated IH to downgrade respirator type shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person in consultation with the Designated IH, shall have the authority to take immediate action to upgrade or downgrade respiratory type when there is an immediate danger to the health and safety of the wearer. Respirators shall be used in the following circumstances:

- a. During all Class I asbestos jobs.
- b. During all Class II work where the ACM is not removed in a substantially intact state.
- c. During all Class II and III work which is not performed using wet methods. Respirators need not be worn during removal of ACM from sloped roofs when a negative exposure assessment has been made and ACM is removed in an intact state.
- d. During all Class II and III asbestos jobs where the Contractor does not produce a negative exposure assessment.
- e. During all Class III jobs where TSI or surfacing ACM is being disturbed.
- f. During all Class IV work performed within regulated areas where employees performing other work are required to wear respirators.

- g. During all work where employees are exposed above the PEL-TWA or PEL-Excursion Limit.
- h. In emergencies

#### 1.12.3 Class I Work

The Contractor shall provide: (1) a tight-fitting, powered air purifying respirator equipped with high efficiency filters, or (2) a full-facepiece supplied air respirator operated in the pressure demand mode, equipped with HEPA egress cartridges, or (3) an auxiliary positive pressure self-contained breathing apparatus, for all employees within the regulated area where Class I work is being performed; provided that a negative exposure assessment has not been produced, and that the exposure level will not exceed 1 f/cc as an 8-hour time weighted average. A full-facepiece supplied air respirator, operated in the pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions, if the exposure assessment indicates exposure levels above 1 f/cc as an 8-hour time weighted average.

# 1.12.4 Class IIWork

The Contractor shall provide an air purifying respirator, other than a disposable respirator, equipped with high-efficiency filters whenever the employee performs Class II asbestos jobs where the Contractor does not produce a negative exposure assessment.

# 1.12.5 Sanitation

Employees who wear respirators shall be permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

# 1.13 HAZARD COMMUNICATION PROGRAM

A hazard communication program shall be established and implemented in accordance with 29 CFR 1926, Section .59. Material safety data sheets (MSDSs) shall be provided for all hazardous materials brought onto the worksite. One copy shall be provided to the Contracting Officer and 1 copy shall be included in the Contractor's Hazard Communication Program.

# 1.14 LICENSES, PERMITS AND NOTIFICATIONS

# 1.14.1 General Legal Requirements

Necessary licenses, permits and notifications shall be obtained in conjunction with the project's asbestos abatement, transportation and disposal actions and timely notification furnished of such actions as required by federal, state, regional, and local authorities. The Contractor shall notify the Regional Office of the USEPA, the Missouri Department of Natural Resources, and the Contracting Officer in writing, at least 20 days prior to the commencement of work, in accordance with 10 CSR 10-6.240, 40 CFR 61, Subpart M, and local requirements to include the mandatory "Notification of Demolition and Renovation Record" form and other required notification documents. Notification shall be by Certified Mail, Return Receipt Requested. The Contractor shall furnish copies of the receipts to the Contracting Officer, in writing, prior to the commencement of work. A copy of the rental company's written acknowledgment and

agreement shall be provided as required by paragraph RENTAL EQUIPMENT. For licenses, permits, and notifications that the Contractor is responsible for obtaining, the Contractor shall pay any associated fees or other costs incurred.

- A. Air Pollution Control Program (Asbestos)
  Missouri Department of Natural Resources
  P.O. Box 176
  Jefferson City, Missouri 65102
- B. Region 7 Asbestos NESHAP Contact Air and Waste Management Division USEPA 901 North 5th Street Kansas City, Kansas 66101 (913) 551-7003

# 1.14.2 Litigation and Notification

The Contractor shall notify the Contracting Officer if any of the following occur:

- a. The Contractor or any of the subcontractors are served with notice of violation of any law, regulation, permit or license which relates to this contract;
- b. Proceedings are commenced which could lead to revocation of related permits or licenses; permits, licenses or other Government authorizations relating to this contract are revoked;
- c. Litigation is commenced which would affect this contract;
- d. The Contractor or any of the subcontractors become aware that their equipment or facilities are not in compliance or may fail to comply in the future with applicable laws or regulations.

# 1.15 PERSONAL PROTECTIVE EQUIPMENT

Three complete sets of personal protective equipment shall be made available to the Contracting Officer and authorized visitors for entry to the regulated area. Contracting Officer and authorized visitors shall be provided with training equivalent to that provided to Contractor employees in the selection, fitting, and use of the required personal protective equipment and the site safety and health requirements. Contractor workers shall be provided with personal protective clothing and equipment and the Contractor shall ensure that it is worn properly. The Contractor's Designated IH and Designated Competent Person shall select and approve all the required personal protective clothing and equipment to be used.

# 1.15.1 Respirators

Respirators shall be in accordance with paragraph RESPIRATORY PROTECTION PROGRAM.

# 1.15.2 Whole Body Protection

Personnel exposed to airborne concentrations of asbestos that exceed the PELs, or for all OSHA Classes of work for which a required negative

exposure assessment is not produced, shall be provided with whole body protection and such protection shall be worn properly. The Contractor's Designated IH and Competent Person shall select and approve the whole body protection to be used. The Competent Person shall examine work suits worn by employees at least once per work shift for rips or tears that may occur during performance of work. When rips or tears are detected while an employee is working, rips and tears shall be immediately mended, or the work suit shall be immediately replaced. Disposable whole body protection shall be disposed of as asbestos contaminated waste upon exiting from the regulated area. Reusable whole body protection worn shall be either disposed of as asbestos contaminated waste upon exiting from the regulated area or be properly laundered in accordance with 29 CFR 1926, Section .1101. Whole body protection used for asbestos abatement shall not be removed from the worksite by a worker to be cleaned. Recommendations made by the Contractor's Designated IH to downgrade whole body protection shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person, in consultation with the Designated IH, has the authority to take immediate action to upgrade or downgrade whole body protection when there is an immediate danger to the health and safety of the wearer.

#### 1.15.2.1 Coveralls

Disposable-breathable coveralls with a zipper front shall be provided. Sleeves shall be secured at the wrists, and foot coverings secured at the ankles. See DETAIL SHEET 13.

# 1.15.2.2 Underwear

Disposable underwear shall be provided. If reusable underwear are used, they shall be disposed of as asbestos contaminated waste or laundered in accordance with 29 CFR 1926, Section .1101. Asbestos abatement workers shall not remove contaminated reusable underwear worn during abatement of ACM from the site to be laundered.

# 1.15.2.3 Work Clothing

An additional coverall shall be provided when the abatement and control method employed does not provide for the exit from the regulated area directly into an attached decontamination unit. Cloth work clothes for wear under the protective coverall, and foot coverings, shall be provided when work is being conducted in low temperature conditions. Cloth work clothes shall be either disposed of as asbestos contaminated waste or properly laundered in accordance with 29 CFR 1926, Section .1101.

# 1.15.2.4 Gloves

Gloves shall be provided to protect the hands. Where there is the potential for hand injuries (i.e., scrapes, punctures, cuts, etc.) a suitable glove shall be provided and used.

# 1.15.2.5 Foot Coverings

Cloth socks shall be provided and worn next to the skin. Footwear, as required by OSHA and EM 385-1-1, that is appropriate for safety and health hazards in the area shall be worn. Rubber boots shall be used in moist or wet areas. Reusable footwear removed from the regulated area shall be thoroughly decontaminated or disposed of as ACM waste. Disposable protective foot covering shall be disposed of as ACM waste. If rubber

boots are not used, disposable foot covering shall be provided.

# 1.15.2.6 Head Covering

Hood type disposable head covering shall be provided. In addition, protective head gear (hard hats) shall be provided as required. Hard hats shall only be removed from the regulated area after being thoroughly decontaminated.

# 1.15.2.7 Protective Eye Wear

Eye protection provided shall be in accordance with ANSI Z87.1.

#### 1.16 HYGIENE FACILITIES AND PRACTICES

The Contractor shall establish a decontamination area for the decontamination of employees, material and equipment. The Contractor shall ensure that employees enter and exit the regulated area through the decontamination area.

#### 1.16.1 Shower Facilities

Shower facilities, when provided, shall comply with 29 CFR 1910, Section .141(d)(3).

# 1.16.2 3-Stage Decontamination Area

A temporary negative pressure decontamination unit that is adjacent and attached in a leak-tight manner to the regulated area shall be provided as described in SET-UP DETAIL SHEET Numbers 22 and 23. Utilization of prefabricated units shall have prior approval of the Contracting Officer. The decontamination unit shall have an equipment room and a clean room separated by a shower that complies with 29 CFR 1910, Section .141 (unless the Contractor can demonstrate that such facilities are not feasible). Equipment and surfaces of containers filled with ACM shall be cleaned prior to removing them from the equipment room or area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste. Two separate lockers shall be provided for each asbestos worker, one in the equipment room and one in the clean room. Hot water service may be secured from the building hot water system provided backflow protection is installed by the Contractor at the point of connection. Should sufficient hot water be unavailable, the Contractor shall provide a minimum 160 L electric water heater with minimum recovery rate of 80 L per hour and a temperature controller for each showerhead. The Contractor shall provide a minimum of 1 shower. Instantaneous type in-line water heater may be incorporated at each shower head in lieu of hot water heater, upon approval by the Contracting Officer. Flow and temperature controls shall be located within the shower and shall be adjustable by the user. The wastewater pump shall be sized for 1.25 times the showerhead flow-rate at a pressure head sufficient to satisfy the filter head loss and discharge line losses. The pump shall supply a minimum  $1.6~\mathrm{L/s}$  flow with  $10.7~\mathrm{m}$  of pressure head. Used shower water shall be collected and filtered to remove asbestos contamination. Filters and residue shall be disposed of as asbestos contaminated material, per DETAIL SHEETS 9 and 14. Filtered water shall be discharged to the sanitary system. Wastewater filters shall be installed in series with the first stage pore size of 20 microns and the second stage pore size of 5 microns. The floor of the decontamination unit's clean room shall be kept dry and clean at all times. Water from the shower shall not be allowed to wet the floor in the clean room. Surfaces of the clean room

and shower shall be wet-wiped 2 times after each shift change with a disinfectant solution. Proper housekeeping and hygiene requirements shall be maintained. Soap and towels shall be provided for showering, washing and drying. Any cloth towels provided shall be disposed of as ACM waste or shall be laundered in accordance with 29 CFR 1926, Section .1101.

#### 1.16.3 Load-Out Unit

A temporary load-out unit that is adjacent and connected to the regulated area, and access tunnel if necessary, shall be provided as described in DETAIL SHEET Number 20 and 25. Utilization of prefabricated units shall have prior approval of the Contracting Officer. The load-out unit shall be attached in a leak-tight manner to each regulated area. Surfaces of the load-out unit and access tunnel shall be adequately wet-wiped 2 times after each shift change. Materials used for wet wiping shall be disposed of as asbestos contaminated waste.

#### 1.16.4 Single Stage Decontamination Area

A decontamination area (equipment room/area) shall be provided for Class I work involving less than 7.5 m or 0.9 square meters of TSI or surfacing ACM, and for Class II asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment produced before the operation. The equipment room or area shall be adjacent to the regulated area for the decontamination of employees, material, and their equipment which is contaminated with asbestos. The equipment room or area shall consist of an area covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste.

# 1.16.5 Decontamination Requirements for Class IV Work

The Contractor shall ensure that employees performing Class IV work within a regulated area comply with the hygiene practice required of employees performing work which has a higher classification within that regulated area, or the Contractor shall provide alternate decontamination area facilities for employees cleaning up debris and material which is TSI or surfacing ACM.

# 1.16.6 Decontamination Area Entry Procedures

The Contractor shall ensure that employees entering the decontamination area through the clean room or clean area:

- a. Remove street clothing in the clean room or clean area and deposit it in lockers.
- b. Put on protective clothing and respiratory protection before leaving the clean room or clean area.
- c. Pass through the equipment room to enter the regulated area.

#### 1.16.7 Decontamination Area Exit Procedures

The Contractor shall ensure that the following procedures are followed:

- a. Before leaving the regulated area, respirators shall be worn while employees remove all gross contamination and debris from their work clothing using a HEPA vacuum.
- b. Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers (see Detail Sheets 9 and 14) for disposal and/or laundering.
- c. Employees shall not remove their respirators in the equipment room.
- d. Employees shall shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, the Contractor shall ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.
- e. After showering, employees shall enter the clean room before changing into street clothes.

#### 1.16.8 Lunch Areas

The Contractor shall provide lunch areas in which the airborne concentrations of asbestos are below 0.01 f/cc.

# 1.16.9 Smoking

Smoking, if allowed by the Contractor, shall only be permitted in designated areas approved by the Contracting Officer.

#### 1.17 REGULATED AREAS

All Class I and II asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they shall demarcate the regulated area. Access to regulated areas shall be limited to authorized persons. The Contractor shall control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

#### 1.18 WARNING SIGNS AND TAPE

Warning signs and tape printed in English shall be provided at the regulated boundaries and entrances to regulated areas. The Contractor shall ensure that all personnel working in areas contiguous to regulated areas comprehend the warning signs. Signs shall be located to allow personnel to read the signs and take the necessary protective steps required before entering the area. Warning signs, as shown and described in DETAIL SHEET 11, shall be in vertical format conforming to 29 CFR 1910 and 29 CFR 1926, Section .1101, a minimum of 500 by 350 mm , and displaying the following legend in the lower panel:

#### DANGER ASBESTOS

# CANCER AND LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY

[RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA]

Spacing between lines shall be at least equal to the height of the upper of any two lines. Warning tape shall be provided as shown and described on DETAIL SHEET 11. Decontamination unit signage shall be as shown and described on DETAIL SHEET 15.

#### 1.19 WARNING LABELS

Warning labels shall be affixed to all asbestos disposal containers used to contain asbestos materials, scrap, waste debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to requirements are acceptable. Warning labels shall be as described in DETAIL SHEET 14, shall conform to 29 CFR 1926, Section .1101 and shall be of sufficient size to be clearly legible displaying the following legend:

# DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD

# 1.20 LOCAL EXHAUST VENTILATION

Local exhaust ventilation units shall conform to ANSI Z9.2 and 29 CFR 1926, Section .1101. Filters on local exhaust system equipment shall conform to ANSI Z9.2 and UL 586. Filter shall be UL labeled.

#### 1.21 TOOLS

Vacuums shall be leak proof to the filter, equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the ACM waste material. Power tools shall not be used to remove ACM unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system, or has otherwise been approved for use by the Contracting Officer. Residual asbestos shall be removed from reusable tools prior to storage and reuse. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

# 1.22 RENTAL EQUIPMENT

If rental equipment is to be used, written notification shall be provided to the rental agency, concerning the intended use of the equipment, the possibility of asbestos contamination of the equipment and the steps that will be taken to decontaminate such equipment. A written acceptance of the terms of the Contractor's notification shall be obtained from the rental agency.

# 1.23 AIR MONITORING EQUIPMENT

The Contractor's Designated IH shall approve air monitoring equipment to be used to collect samples. The equipment shall include, but shall not be limited to:

- a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute when equipped with a sampling train of tubing and filter cassette.
- b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute when equipped with a sampling train of tubing and filter cassette, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps shall also be equipped with an automatic flow control unit which shall maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
- c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands, to be used with low flow pumps in accordance with 29 CFR 1926, Section .1101 for personal air sampling.
- d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands, to be used with high flow pumps when conducting environmental area sampling using NIOSH Pub No. 84-100 Methods 7400 and 7402.
- e. Appropriate plastic tubing to connect the air sampling pump to the selected filter cassette.
- f. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 20 to plus 60 degrees C and traceable to a NIST primary standard.

#### 1.24 EXPENDABLE SUPPLIES

# 1.24.1 Glovebag

Glovebags shall be provided as described in 29 CFR 1926, Section .1101 and SET-UP DETAIL SHEET 10. The glovebag assembly shall be  $0.15~\mathrm{mm}$  thick plastic, prefabricated and seamless at the bottom with preprinted OSHA warning label.

# 1.24.2 Duct Tape

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container shall be provided.

# 1.24.3 Disposal Containers

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers shall be provided for ACM wastes as required by 29 CFR 1926 Section .1101 and DETAIL SHEETS 9A, 9B, 9C and 14.

# 1.24.4 Disposal Bags

Leak-tight bags, 0.15 mm thick, shall be provided for placement of asbestos generated waste as described in DETAIL SHEET 9A.

#### 1.24.5 Fiberboard Drums

Fiberboard drums shall be provided if required by state or local regulations.

#### 1.24.6 Cardboard Boxes

Heavy-duty corrugated cardboard boxes, coated with plastic or wax to retard deterioration from moisture, shall be provided as described in DETAIL SHEET 9C, if required by state and local requirements. Boxes shall fit into selected ACM disposal bags. Filled boxes shall be sealed leak-tight with duct tape.

#### 1.24.7 Sheet Plastic

Sheet plastic shall be polyethylene of 0.15 mm minimum thickness and shall be provided in the largest sheet size necessary to minimize seams ,as indicated on the project drawings. Film shall conform to ASTM D 4397, except as specified below:

#### 1.24.7.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets shall be provided. Film shall conform to the requirements of NFPA 701.

#### 1.24.7.2 Reinforced

Reinforced sheets shall be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

#### 1.24.8 Amended Water

Amended water shall meet the requirements of ASTM D 1331.

# 1.24.9 Mastic Removing Solvent

Mastic removing solvent shall be nonflammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite shall have a flash point greater than 60 degrees C.

# 1.24.10 Leak-tight Wrapping

Two layers of 0.15 mm minimum thick polyethylene sheet stock shall be used for the containment of removed asbestos-containing components or materials too large to be placed in disposal bags as described in DETAIL SHEET 9B. Upon placement of the ACM component or material, each layer shall be individually leak-tight sealed with duct tape.

# 1.24.11 Viewing Inspection Window

Where feasible, a minimum of 1 clear, 3 mm thick, acrylic sheet, 450 by 610 mm, shall be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows shall be sealed leak-tight with industrial grade duct tape.

# 1.24.12 Wetting Agents

Removal encapsulant (a penetrating encapsulant) shall be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant shall be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS.

# 1.24.13 Strippable Coating

Strippable coating in aerosol cans shall be used to adhere to surfaces and to be removed cleanly by stripping, at the completion of work. This work shall only be done in well ventilated areas.

# 1.25 MISCELLANEOUS ITEMS

A sufficient quantity of other items, such as, but not limited to: scrapers, brushes, brooms, staple guns, tarpaulins, shovels, rubber squeegees, dust pans, other tools, scaffolding, staging, enclosed chutes, wooden ladders, lumber necessary for the construction of containments, UL approved temporary electrical equipment, material and cords, ground fault circuit interrupters, water hoses of sufficient length, fire extinguishers, first aid kits, portable toilets, logbooks, log forms, markers with indelible ink, spray paint in bright color to mark areas, project boundary fencing, etc., shall be provided.

#### PART 2 PRODUCTS

#### 2.1 ENCAPSULANTS

Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent and shall meet the following requirements:

#### ALL ENCAPSULANTS

Requirement Test Standard

Flame Spread - 25, ASTM E 84

Smoke Emission - 50

Combustion Toxicity Univ. of Pittsburgh Protocol

Zero Mortality

Life Expectancy, 20 yrs ASTM C 732
Accelerated Aging Test

Permeability, Min. 23 ng per ASTM E 96

Pa-sec-square m

Additional Requirements for Bridging Encapsulant

Requirement Test Standard

Cohesion/Adhesion Test, ASTM E 736

730 N/m

Fire Resistance, Negligible ASTM E 119

affect on fire resistance

rating over 3 hour test (Classified

by UL for use over fibrous and

#### ALL ENCAPSULANTS

Requirement Test Standard

cementitious sprayed fireproofing)

Impact Resistance, Min. ASTM D 2794

4.7 N-m (Gardner Impact Test)

Flexibility, no rupture or ASTM D 522

cracking (Mandrel Bend Test)

#### Additional Requirements for Penetrating Encapsulant

Requirement Test Standard

Cohesion/Adhesion Test, ASTM E 736

730 N/m

Fire Resistance, Negligible ASTM E 119

affect on fire resistance

rating over 3 hour test (Classified

by UL for use over fibrous and

cementitious sprayed fireproofing)

Impact Resistance, Min. ASTM D 2794

4.7 N-m (Gardner Impact Test)

Flexibility, no rupture or ASTM D 522

cracking (Mandrel Bend Test)

## Additional Requirements for Lockdown Encapsulant

#### Requirement Test Standard

Fire Resistance, Negligible ASTM E 119

affect on fire resistance

rating over 3 hour test (Tested

with fireproofing over encapsulant

applied directly to steel member)

Bond Strength, 1.5 kN/m ASTM E 736

(Tests compatibility with cementitious and fibrous

fireproofing)

## 2.2 RECYCLABLE MATERIALS

The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

#### PART 3 EXECUTION

#### 3.1 GENERAL REQUIREMENTS

Asbestos abatement work tasks shall be performed as summarized in paragraph DESCRIPTION OF WORK and including Table 1 and the Contractor's Accident Prevention Plan, Asbestos Hazard Abatement Plan, and the Activity Hazard Analyses. The Contractor shall use the engineering controls and work practices required in 29 CFR 1926, Section .1101(g) in all operations regardless of the levels of exposure. Personnel shall wear and utilize protective clothing and equipment as specified. The Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area. All hot work (burning, cutting, welding, etc.) shall be

conducted under controlled conditions in conformance with 29 CFR 1926, Section .352, Fire Prevention. Personnel of other trades, not engaged in asbestos abatement activities, shall not be exposed at any time to airborne concentrations of asbestos unless all the administrative and personal protective provisions of the Contractor's Accident Prevention Plan are complied with. Power to the regulated area shall be locked-out and tagged in accordance with 29 CFR 1910, and temporary electrical service with ground fault circuit interrupters shall be provided as needed. Temporary electrical service shall be disconnected when necessary for wet removal. The Contractor shall stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. The Contractor shall correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work shall resume only upon notification by the Contracting Officer. Corrective actions shall be documented.

#### 3.2 PROTECTION OF ADJACENT WORK OR AREAS TO REMAIN

Asbestos abatement shall be performed without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government, as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, work shall stop in all effected areas immediately and the spill shall be cleaned. When satisfactory visual inspection and air sampling analysis results are obtained and have been evaluated by the Contractor's Designated IH and the Contracting Officer, work shall proceed.

#### 3.3 OBJECTS

## 3.3.1 Removal of Mobile Objects

Mobile objects, furniture, personal items, and equipment will be removed from the area of work by the Government before asbestos abatement work begins.

#### 3.3.2 Stationary Objects

Stationary objects, furniture, and equipment shall remain in place and shall be precleaned using HEPA vacuum followed by adequate wet wiping. Stationary objects and furnishings shall be covered with 2 layers of polyethylene and edges sealed with duct tape.

## 3.4 BUILDING VENTILATION SYSTEM AND CRITICAL BARRIERS

Building ventilating systems supplying air into or returning air out of a regulated area shall be shut down and isolated by lockable switch or other positive means in accordance with 29 CFR 1910, Section .147. Air-tight critical barriers shall be installed on building ventilating openings located inside the regulated area that supply or return air from the building ventilation system or serve to exhaust air from the building. The critical barriers shall consist of 2 layers of polyethylene. Edges to wall, ceiling and floor surfaces shall be sealed with industrial grade duct tape. Critical barriers shall be installed as shown on appended SET-UP DETAIL SHEETS.

#### 3.5 PRECLEANING

Surfaces shall be cleaned by HEPA vacuum and adequately wet wiped prior to establishment of containment.

#### 3.6 METHODS OF COMPLIANCE

#### 3.6.1 Mandated Practices

The Contractor shall employ proper handling procedures in accordance with 29 CFR 1926 and 40 CFR 61, Subpart M, and the specified requirements. The specific abatement techniques and items identified shall be detailed in the Contractor's Asbestos Hazard Abatement Plan including, but not limited to, details of construction materials, equipment, and handling procedures. The Contractor shall use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

- Vacuum cleaners equipped with HEPA filters to collect debris and dust containing ACM.
- b. Wet methods or wetting agents to control employee exposures during asbestos handling, removal, cutting, and cleanup; except where it can be demonstrated that the use of wet methods is unfeasible due to, for example, the creation of electrical hazards, equipment malfunction, and in roofing.
- c. Prompt clean-up and disposal in leak-tight containers of wastes and debris contaminated with asbestos.
- d. Inspection and repair of polyethylene in work and high traffic areas.
- e. Cleaning of equipment and surfaces of containers filled with ACM prior to removing them from the equipment room or area.

## 3.6.2 Control Methods

The Contractor shall use the following control methods to comply with the PELs:

- a. Local exhaust ventilation equipped with HEPA filter dust collection systems;
- b. Enclosure or isolation of processes producing asbestos dust;
- c. Ventilation of the regulated area to move contaminated air away from the breathing zone of employees and toward a filtration or collection device equipped with a HEPA filter;
- d. Use of other work practices and engineering controls;
- e. Where the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the PELs, the Contractor shall use them to reduce employee exposure to the lowest levels attainable by these controls and shall supplement them by the use of respiratory protection that complies with paragraph, RESPIRATORY PROTECTION PROGRAM.

#### 3.6.3 Unacceptable Practices

The following work practices and engineering controls shall not be used for work related to asbestos or for work which disturbs ACM, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- b. Compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
- c. Dry sweeping, shoveling, or other dry clean-up of dust and debris containing ACM.
- d. Employee rotation as a means of reducing employee exposure to asbestos.

#### 3.6.4 Negative Pressure Enclosure (NPE) System

The NPE system shall be as shown in SETUP DETAIL SHEET 4 and 8. The system shall provide at least 4 air changes per hour inside the containment. The local exhaust unit equipment shall be operated 24 hours per day until the containment is removed, and shall be leak-proof to the filter and equipped with HEPA filters. Air movement shall be directed away from the employees and toward a HEPA filtration device. The NPE shall be smoke tested for leaks at the beginning of each shift. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.5 mm of water column relative to adjacent, unsealed areas. Pressure differential shall be monitored continuously, 24 hours per day, with an automatic manometric recording instrument. Pressure differential recordings shall be provided daily on the same day collected. Readings shall be reviewed by the Contractor's Designated Competent Person and IH prior to submittal. Contracting Officer shall be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system shall not be used as the local exhaust system for the regulated area. The local exhaust system shall terminate outdoors unless an alternate arrangement is allowed by the Contract Officer. All filters used shall be new at the beginning of the project and shall be periodically changed as necessary and disposed of as ACM waste.

## 3.6.5 Mini-Enclosures

Mini-containment (small walk-in enclosure) as shown in SETUP DETAIL SHEET 7 to accommodate no more than 2 persons, may be used if the disturbance or removal can be completely contained by the enclosure with the following specifications and work practices. The mini-enclosure shall be inspected for leaks and smoke tested before each use. Air movement shall be directed away from the employee's breathing zone within the mini-enclosure.

## 3.6.6 Class II Work

In addition to the requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

- a. A Competent Person shall supervise the work.
- b. For indoor work, critical barriers shall be placed over all openings to the regulated area.
- c. Impermeable dropcloths shall be placed on surfaces beneath all removal activity.

#### 3.6.7 Specific Control Methods for Class II Work

In addition to requirements of paragraph Class II Work, Class II work shall be performed using the following methods:

## 3.6.7.1 Vinyl Flooring Materials

When removing vinyl flooring materials which contain ACM, the Contractor shall use the following practices as shown in SETUP DETAIL SHEET 4 and RESPONSE ACTION DETAIL SHEET 62. Tiles shall be removed intact (if possible); wetting is not required when tiles are heated and removed intact. Flooring or its backing shall not be sanded. Scraping of residual adhesive and/or backing shall be performed using wet methods. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. The Contractor shall use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) to clean floors.

#### 3.6.7.2 Other Class II Jobs

The Contractor shall use the enclosure as shown in SETUP DETAIL SHEET 4 when performing Class II removal of the paper underlayment ACM. This paper underlayment was identified under vinyl sheet flooring and wood subflooring in the bathroom. The material shall be thoroughly wetted with amended water prior to and during its removal. The material shall be removed in an intact state as possible. Cutting or abrading the material is prohibited. The ACM removed shall be immediately bagged or wrapped. After the material is removed, prepare the area for final clearance sampling as shown on SETUP DETAIL SHEET 17.

The Contractor shall use the enclosure as shown in SETUP DETAIL SHEET 1 and work practices as shown RESPONSE ACTION DETAIL SHEET 45 when performing Class II removal of the sealant ACM. This sealant was identified in floor penetrations in the furnace closets. The material shall be thoroughly wetted with amended water prior to and during its removal. The material shall be removed in an intact state as possible. Cutting or abrading the material is prohibited. The ACM removed shall be immediately bagged or wrapped.

The Contractor shall use the enclosure as shown in SETUP DETAIL SHEET 21 and work practices as shown RESPONSE ACTION DETAIL SHEET 45 when performing Class II removal of the sink lining ACM. This material was identified on stainless steel sinks in the kitchens. The material shall be thoroughly wetted with amended water prior to and during its removal. The entire sink shall be removed intact. The removed sink shall be immediately bagged or wrapped.

# 3.6.8 Cleaning After Asbestos Removal

After completion of all asbestos removal work, surfaces from which ACM has been removed shall be wet wiped or sponged clean, or cleaned by some equivalent method to remove all visible residue. Run-off water shall be collected and filtered through a dual filtration system. A first filter shall be provided to remove fibers 20 micrometers and larger, and a final filter provided that removes fibers 5 micrometers and larger. After the gross amounts of asbestos have been removed from every surface, remaining visible accumulations of asbestos on floors shall be collected using plastic shovels, rubber squeegees, rubber dustpans, and HEPA vacuum cleaners as appropriate to maintain the integrity of the regulated area. Surfaces or locations which could harbor accumulations or residual asbestos dust shall be checked after vacuuming to verify that no asbestos-containing material remains; and shall be re-vacuumed as necessary to remove the ACM.

- 3.6.9 Class II Asbestos Work Response Action Detail Sheets
  The following Class II Asbestos Work Response Action Detail Sheet is
  specified on Table 1 for each individual work task to be performed:
  - a. Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos Free Adhesive: See Sheet 62
  - b. Miscellaneous Asbestos-Containing Materials: See Sheet 45

#### 3.7 FINAL CLEANING AND VISUAL INSPECTION

Upon completion of abatement, the regulated area shall be cleaned by collecting, packing, and storing all gross contamination; see SET-UP DETAIL SHEETS 9, 14 and 20. A final cleaning shall be performed using HEPA vacuum and wet cleaning of all exposed surfaces and objects in the regulated area. Upon completion of the cleaning, the Contractor shall conduct a visual pre-inspection of the cleaned area in preparation for a final inspection before final air clearance monitoring and recleaning, as necessary. Upon completion of the final cleaning, the Contractor and the Contracting Officer shall conduct a final visual inspection of the cleaned regulated area in accordance with ASTM E 1368 and document the results on the Final Cleaning and Visual Inspection as specified on the SET-UP DETAIL SHEET 19. If the Contracting Officer rejects the clean regulated area as not meeting final cleaning requirements, the Contractor shall reclean as necessary and have a follow-on inspection conducted with the Contracting Officer. Recleaning and follow-up reinspection shall be at the Contractor's expense.

#### 3.8 LOCKDOWN

Prior to removal of plastic barriers and after clean-up of gross contamination and final visual inspection, a post removal (lockdown) encapsulant shall be spray applied to ceiling, walls, floors, and other surfaces in the regulated area.

- 3.9 EXPOSURE ASSESSMENT AND AIR MONITORING
- 3.9.1 General Requirements For Exposure

Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926, Section .1101, the Contractor's air monitoring plan, and as specified. Personal exposure air monitoring (collected at the breathing zone) that is representative of the exposure of each employee who is assigned to work

within a regulated area shall be performed by the Contractor's Designated IH. Breathing zone samples shall be taken for at least 25 percent of the workers in each shift, or a minimum of 2, whichever is greater. Air monitoring results at the 95 percent confidence level shall be calculated as shown in Table 2 at the end of this section. The Contractor shall provide an onsite independent testing laboratory with qualified analysts and appropriate equipment to conduct sample analyses of air samples using the methods prescribed in 29 CFR 1926, Section .1101, to include NIOSH Pub No. 84-100 Method 7400. Preabatement and abatement environmental air monitoring shall be performed by the Contractor's Designated IH. Final clearance environmental air monitoring, shall be performed by the Contractor's Designated IH. Environmental and final clearance air monitoring shall be performed using NIOSH Pub No. 84-100 Method 7400 (PCM) with optional confirmation of results by NIOSH Pub No. 84-100 Method 7402 (TEM). For environmental and final clearance, air monitoring shall be conducted at a sufficient velocity and duration to establish the limit of detection of the method used at  $0.005 \, \mathrm{f/cc}$ . Confirmation of asbestos fiber concentrations (asbestos f/cc) from environmental and final clearance samples collected and analyzed by NIOSH Pub No. 84-100 Method 7400 (total f/cc) may be conducted using TEM in accordance with NIOSH Pub No. 84-100 Method 7402. When such confirmation is conducted, it shall be from the same sample filter used for the NIOSH Pub No. 84-100 Method 7400 PCM analysis. For all Contractor required environmental or final clearance air monitoring, confirmation of asbestos fiber concentrations, using NIOSH Pub No. 84-100 Method 7402, shall be at the Contractor's expense. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. Results of breathing zone samples shall be posted at the job site and made available to the Contracting Officer. The Contractor shall maintain a fiber concentration inside a regulated area less than or equal to 0.1 f/cc expressed as an 8 hour, time-weighted average (TWA) during the conduct of the asbestos abatement. If fiber concentration rises above  $0.1\,$ f/cc, work procedures shall be investigated with the Contracting Officer to determine the cause. At the discretion of the Contracting Officer, fiber concentration may exceed 0.1 f/cc but shall not exceed 1.0 f/cc expressed as an 8-hour TWA. The Contractor's workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should either an environmental concentration of 1.0 f/cc expressed as an 8-hour TWA or a personal excursion concentration of 1.0 f/cc expressed as a 30-minute sample occur inside a regulated work area, the Contractor shall stop work immediately, notify the Contracting Officer, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Work shall not restart until authorized by the Contracting Officer.

## 3.9.2 Initial Exposure Assessment

The Contractor's Designated IH shall conduct an exposure assessment immediately before or at the initiation of an asbestos abatement operation to ascertain expected exposures during that operation. The assessment shall be completed in time to comply with the requirements which are triggered by exposure data or the lack of a negative exposure assessment, and to provide information necessary to assure that all control systems planned are appropriate for that operation. The assessment shall take into consideration both the monitoring results and all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace, or of the operations of the Contractor which indicate the levels of airborne asbestos likely to be encountered on the job.

## 3.9.3 Negative Exposure Assessment

The Contractor shall provide a negative exposure assessment for the specific asbestos job which will be performed. The negative exposure assessment shall be provided within 5 days of the initiation of the project and conform to the following criteria:

- a. Objective Data: Objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the PEL-TWA and PEL-Excursion Limit under those work conditions having the greatest potential for releasing asbestos.
- b. Prior Asbestos Jobs: Where the Contractor has monitored prior asbestos jobs for the PEL and the PEL-Excursion Limit within 12 months of the current job, the monitoring and analysis were performed in compliance with asbestos standard in effect; the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the Contractor's current operations; the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job; and these data show that under the conditions prevailing and which will prevail in the current workplace, there is a high degree of certainty that the monitoring covered exposure from employee exposures will not exceed the PEL-TWA and PEL-Excursion Limit.
- c. Initial Exposure Monitoring: The results of initial exposure monitoring of the current job, made from breathing zone air samples that are representative of the 8-hour PEL-TWA and 30-minute short-term exposures of each employee. The monitoring covered exposure from operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

## 3.9.4 Independent Environmental Monitoring

The air monitoring contractor has been provided a copy of the contract that includes this abatement work. The abatement contractor will provide the air monitoring contractor with an up-to-date copy of the accepted Asbestos Hazard Abatement Plan, Accident Prevention Plan and pertinent detailed drawings. The air monitoring contractor is required to comply with the abatement contractor's safety and health requirements. The abatement contractor will coordinate all onsite activities with the air monitoring contractor, the COR, and other affected parties as directed by the COR. The abatement contractor will provide the air monitoring contractor with an up-to-date schedule of abatement contractor work activities. The air monitoring contractor will coordinate with the abatement contractor and the COR during the performance Government required air monitoring. The abatement contractor is responsible for performing exposure assessment and personal air monitoring of abatement contractor's work. The air monitoring contractor is responsible for performing these tasks for its employee.

## 3.9.5 Preabatement Environmental Air Monitoring

Preabatement environmental air monitoring shall be established 1 day prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins. As a minimum, preabatement air samples shall be collected using NIOSH Pub No. 84-100 Method 7400, PCM at these locations: outside the building; inside the building, but outside the regulated area perimeter; and inside each regulated work area. One sample shall be collected for every 185 square meters of floor space. At least 2 samples shall be collected outside the building: at the exhaust of the HEPA unit; and downwind from the abatement site. The PCM samples shall be analyzed within 24 hours; and if any result in fiber concentration greater than 0.01 f/cc, asbestos fiber concentration shall be confirmed using NIOSH Pub No. 84-100 Method 7402 (TEM).

## 3.9.6 Environmental Air Monitoring During Abatement

Until an exposure assessment is provided to the Contracting Officer, environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. The assessment shall demonstrate that the product or material containing asbestos minerals, or the abatement involving such product or material, cannot release airborne asbestos fibers in concentrations exceeding 0.01 f/cc as a TWA under those work conditions having the greatest potential for releasing asbestos. The monitoring shall be at least once per shift at locations including, but not limited to, close to the work inside a regulated area; preabatement sampling locations; outside entrances to a regulated area; close to glovebag operations; representative locations outside of the perimeter of a regulated area; inside clean room; and at the exhaust discharge point of local exhaust system ducted to the outside of a containment (if used). If the sampling outside regulated area shows airborne fiber levels have exceeded background or 0.01~f/cc, whichever is greater, work shall be stopped immediately, and the Contracting Officer notified. The condition causing the increase shall be corrected. Work shall not restart until authorized by the Contracting Officer.

#### 3.9.7 Final Clearance Air Monitoring

Prior to conducting final clearance air monitoring, the Contractor and the Contracting Officer shall conduct a final visual inspection of the regulated area where asbestos abatement has been completed. The final visual inspection shall be as specified in SET-UP DETAIL SHEET 19. Final clearance air monitoring shall not begin until acceptance of the Contractor's final cleaning by the Contracting Officer. The Contractor's Designated IH shall conduct final clearance air monitoring using aggressive air sampling techniques as defined in EPA 560/5-85-024 or as otherwise required by federal or state requirements. The sampling and analytical method used will be NIOSH Pub No. 84-100 Method 7400 (PCM) and Table 3 with confirmation of results by NIOSH Pub No. 84-100 Method 7402 (TEM).

#### 3.9.7.1 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH Pub No. 84-100 Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, shall be less than 0.01~f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01~total f/cc, the asbestos fiber concentration (asbestos f/cc) shall be confirmed from that same filter using NIOSH Pub No. 84-100~Method 7402~(TEM) at Contractor's expense. If any confirmation sample result is greater than

0.01 asbestos f/cc, abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done.

#### 3.9.7.2 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, the Contractor shall pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

#### 3.9.8 Air-Monitoring Results and Documentation

Air sample fiber counting shall be completed and results provided within 24 hours after completion of a sampling period. The Contracting Officer shall be notified immediately of any airborne levels of asbestos fibers in excess of established requirements. Written sampling results shall be provided within 5 working days of the date of collection. The written results shall be signed by testing laboratory analyst, testing laboratory principal and the Contractor's Designated IH. The air sampling results shall be documented on a Contractor's daily air monitoring log. The daily air monitoring log shall contain the following information for each sample:

- a. Sampling and analytical method used;
- b. Date sample collected;
- c. Sample number;
- e. Location/activity/name where sample collected;
- f. Sampling pump manufacturer, model and serial number, beginning flow rate, end flow rate, average flow rate (L/min);
- g. Calibration date, time, method, location, name of calibrator, signature;
- h. Sample period (start time, stop time, elapsed time (minutes);
- i. Total air volume sampled (liters);
- j. Sample results (f/cc);
- k. Laboratory name, location, analytical method, analyst, confidence level. In addition, the printed name and a signature and date block for the Industrial Hygienist who conducted the sampling and for the Industrial Hygienist who reviewed the daily air monitoring log verifying the accuracy of the information.

## 3.10 CLEARANCE CERTIFICATION

When asbestos abatement is complete, ACM waste is removed from the regulated areas, and final clean-up is completed, the Contracting Officer will certify the areas as safe before allowing the warning signs and boundary warning tape to be removed. After final clean-up and acceptable airborne concentrations are attained, but before the HEPA unit is turned

off and the containment removed, the Contractor shall remove all pre-filters on the HVAC system servicing the work area and provide new pre-filters. The Contractor shall dispose of such filters as asbestos contaminated materials. HVAC, mechanical, and electrical systems shall be re-established in proper working order. The Contractor and the Contracting Officer shall visually inspect all surfaces within the containment for residual material or accumulated debris. The Contractor shall reclean all areas showing dust or residual materials. The Contracting Officer will certify in writing that the area is safe before unrestricted entry is permitted. The Government will have the option to perform monitoring to certify the areas are safe before entry is permitted.

#### 3.11 CLEANUP AND DISPOSAL

#### 3.11.1 Title to ACM Materials

ACM material resulting from abatement work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified and in accordance with applicable federal, state and local regulations.

#### 3.11.2 Collection and Disposal of Asbestos

All ACM waste shall be collected and including contaminated wastewater filters, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing, shall be collected and placed in leak-tight containers such as double plastic bags (see DETAIL SHEET 9A); sealed double wrapped polyethylene sheet (see DETAIL 9B); sealed fiberboard boxes (see DETAIL SHEET 9C); or other approved containers. Waste within the containers shall be wetted in case the container is breeched. Asbestos-containing waste shall be disposed of at an EPA, state and local approved asbestos landfill. For temporary storage, sealed impermeable containers shall be stored in an asbestos waste load-out unit or in a storage/transportation conveyance (i.e., dumpster, roll-off waste boxes, etc.) in a manner acceptable to and in an area assigned by the Contracting Officer. Procedure for hauling and disposal shall comply with 40 CFR 61, Subpart M, state, regional, and local standards.

## 3.11.3 Scale Weight Measurement

Scales used for measurement shall be public scales. Weighing shall be at a point nearest the work at which a public scale is available. Scales shall be standard truck scales of the beam type; scales shall be equipped with the type registering beam and an "over and under" indicator; and shall be capable of accommodating the entire vehicle. Scales shall be tested, approved and sealed by an inspector of the State of Missouri. Scales shall be calibrated and resealed as often as necessary and at least once every three months to ensure continuous accuracy. Vehicles used for hauling ACM shall be weighed empty daily at such time as directed and each vehicle shall bear a plainly legible identification mark.

# 3.11.4 Weigh Bill and Delivery Tickets

Copies of weigh bills and delivery tickets shall be submitted to the Contracting Officer during the progress of the work. The Contractor shall furnish the Contracting Officer scale tickets for each load of ACM weighed and certified. These tickets shall include tare weight; identification mark for each vehicle weighed; and date, time and location of loading and unloading. Tickets shall be furnished at the point and time individual

trucks arrive at the worksite. A master log of all vehicle loading shall be furnished for each day of loading operations. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified weigh bills and/or certified tickets and manifests of all ACM actually disposed by the Contractor for this contract.

## 3.11.5 Asbestos Waste Shipment Record

The Contractor shall complete and provide the Contracting Officer final completed copies of the Waste Shipment Record for all shipments of waste material as specified in 40 CFR 61, Subpart M and other required state waste manifest shipment records, within 3 days of delivery to the landfill. Each Waste Shipment Record shall be signed and dated by the [Contractor] [Contracting Officer], the waste transporter and disposal facility operator.

#### TABLE 1

#### SUMMARY OF WORK TASKS

TASK(1) A B C D
LOCATION(2) Kitchen, Entry Bathrooms Furnace Closets Kitchen
DESCRIPTION(3) Vinyl Floor Tile Paper Underlayment Sealant Sink Lining

TECHNIQUE(4) REM REM REM REM FRIABLE(5) NF-1 FR NF-1 FR FORM(6) IA IA IA IA CONDITION(6) G G G G QUANTITY(7) LINEAR FT.

SQUARE FEET 200 35 1 4 EACH NOTES:

- (1) Alpha sequence of work tasks (A, B, C, etc.). Each category of friability has a separate task.
- (2) Specific location of the work (building, floor, area, etc.)
- (3) Description of material.
- (4) Technique to be used: Removal = REM; Dismantle = DISM; Encapsulation = ENCAP; Encasement = ENCAS; Enclosure = ENCL; Repair = REP.
- (5) Friability of materials: Friable = FR; Non-friable = NF-1 or NF-2; (number indicates friable category).
- (6) Form: Interior or Exterior Architectural = IA or EA;
  Mechanical/Electrical = ME. Condition: Good = G; Fair = F; Poor = P.
- (7) Quantity of ACM in Linear Feet (ft); Square Feet (sf); Each number of items.

#### TABLE 2

# FORMULA FOR CALCULATION OF THE 95 PERCENT CONFIDENCE LEVEL (Reference: NIOSH 7400)

Fibers/cc(01.95 percent CL) = X + [(X) \* (1.645) \* (CV)]

Where: X = ((E)(AC))/((V)(1000))

E = ((F/Nf) - (B/Nb))/Af

CV = The precision value; 0.45 shall be used unless the analytical laboratory provides the Contracting Officer with documentation (Round Robin Program participation and results) that the laboratory's precision is better.

AC = Effective collection area of the filter in square millimeters

V = Air volume sampled in liters

E = Fiber density on the filter in fibers per square millimeter

F/Nf = Total fiber count per graticule field

B/Nb = Mean field blank count per graticule field

Af = Graticule field area in square millimeters

TWA = C1/T1 + C2/T2 = Cn/Tn

Where: C = Concentration of contaminant

T = Time sampled.

TABLE 3

NIOSH METHOD 7400

PCM ENVIRONMENTAL AIR SAMPLING PROTOCOL (NON-PERSONAL)

Sample Location	Minimum No. of Samples	Filter Pore Size (Note 1)	Min. Vol. (Note 2) (Liters)	Sampling Rate (liters/min.)
Inside Abatement Area	0.5/140 Square Meters (Notes 3 & 4)	0.45 microns	3850	2-16
Each Room in 1 Abatement Area Less than 140 Square meters		0.45 microns	3850	2-16
Field Blank	2	0.45 microns	0	0
Laboratory Blank	1	0.45 microns	0	0

## Notes:

- 1. Type of filter is Mixed Cellulose Ester.
- 2. Ensure detection limit for PCM analysis is established at  $0.005~{\rm fibers/cc.}$
- 3. One sample shall be added for each additional 140 square meters. (The corresponding I-P units are 5/1500 square feet).
- 4. A minimum of 5 samples are to be taken per abatement area, plus 2 field blanks.

TABLE 4

EPA AHERA METHOD: TEM AIR SAMPLING PROTOCOL

Location Sampled	Minimum No. of Samples	Filter Pore Size	Min. Vol. (Liters)	Sampling Rate (liters/min.)
Inside Abatement Area	5	0.45 microns	1500	2-16
Outside Abatement Area	5	0.45 microns	1500	2-16
Field Blank	2	0.45 microns	0	0
Laboratory Blank	1	0.45 microns	0	0

# Notes:

- 1. Type of filter is Mixed Cellulose Ester.
- 2. The detection limit for TEM analysis is 70 structures/square mm.

# CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME \_\_\_\_\_ CONTRACT NO. \_\_\_\_

PROJECT ADDRESS CONTRACTOR FIRM			
EMPLOYEE'S NAME	INAME		<u> </u>
(Print)	(Last)	(First)	
Social Security	Number:	,	
BEEN LINKED V INHALE ASBEST	ASBESTOS CAN BE DANGEROU WITH TYPES OF LUNG DISEAS TOS FIBERS, THE CHANCE TH HAN THAT OF THE NONSMOKIN	E AND CANCER. I AT YOU WILL DEVE	BESTOS FIBERS HAS F YOU SMOKE AND CLOP LUNG CANCER
and you complete will perform and personal protect its use; and the capacity to perfonditions expected equipment. These certification, yobligations to yocheck the block (Review the check	contract for the above per formal asbestos training project specific training tive equipment including at you receive a medical form your assigned work to ted, while wearing the reset things are to be done you are acknowledging that you. The Contractor's Deficient of the type of formated blocks prior to signing	g specific to th ng; that you be a respirator, th examination to e asks, under the equired personal at no cost to yo t your employer signated Industr l training you h	the type of work you supplied with proper lat you be trained in evaluate your physical environmental protective ou. By signing this has met these rial Hygienist will have completed.
Model Accreditat	ompetent Persons and Supe tion Program (MAP) traini State's requirements.		
(1) F course (2) F than c tile, that m (3) F type c of 29 CFR 1926, practices and er hands-on trainir	Section $.1101(\bar{k})(9)(viii)$ agineering controls of 29 ag.	his State's requester there will rials, i.e., room EPA's MAP train ements. Here will only be a shour training to the control of the control o	be abatement of more ofing, siding, floor ning course, "Worker", be abatement of one class on the elements to the specific work on .1101(g) and
that meets this  (4) F course consister agency maintenar the elements of	(b) I have completed EPA State's requirements. For OSHA Class III work: It with EPA requirements are and custodial staff a 29 CFR 1926, Section .11 ractices and engineering aining.	I have complete for training of t 40 CFR 763, Se 01(k)(9)(viii),	ed at least a 16-hour local education ection .92(a)(2) and in addition to the

# CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

(5) For OSHA Class IV work: I have completed a course consistent with EPA requirements for training of lagency maintenance and custodial staff at 40 CFR 763, (a) elements of 29 CFR 1926, Section .1101(k)(9)(viii), in add specific work practices and engineering controls at 29 CFR and hands-on training.	ocal education (1), and the dition to the
c. Workers, Supervisors and the Designated Competer completed annual refresher training as required by EPA's I State's requirements.	
PROJECT SPECIFIC TRAINING:  I have been provided and have completed the project required by this Contract. My employer's Designated Industry Designated Competent Person conducted the training.	
RESPIRATORY PROTECTION:  I have been trained in accordance with the criterial Contractor's Respiratory Protection program. I have been dangers of handling and breathing asbestos dust and in the procedures and use and limitations of the respirator(s) I been trained in and will abide by the facial hair and consoft my employer.	trained in the e proper work will wear. I have
RESPIRATOR FIT-TEST TRAINING:  I have been trained in the proper selection, fit, to cleaning, maintenance, and storage of the respirator(s) that have been fit-tested in accordance with the criteria in the Respiratory Program and have received a satisfactory fit. assigned my individual respirator. I have been taught how perform positive and negative pressure fit-check upon done pressure respirators each time.	at I will wear. I he Contractor's I have been w to properly
MEDICAL EXAMINATION:  I have had a medical examination within the last to was paid for by my employer. The examination included: I pulmonary function tests, and may have included an evaluation and a determination regarding my physician work tasks on the project while wearing personal procluding a respirator. I was personally provided a copy results of that examination. My employer's Industrial Hypton the medical certification provided by the physician and chappropriate blank below. The physician determined that the	health history, tion of a chest sical capacity to protective equipment and informed of the gienist evaluated hecked the
were no limitations to performing the required work were identified physical limitations to performing tasks.	
Date of the medical examination	
Employee Signature Contractor's Industrial	date
Hygienist Signature	date
End of Section	

13280-48

Appendix Part 1: Click in box. To return to text, click on arrow above.

Appendix Part 2: Click in box. To return to text, click on arrow above.

#### SECTION 13281A

# LEAD HAZARD CONTROL ACTIVITIES 03/02

#### PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 1553	(1993) Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities
ASTM E 1613	(1999) Standard Test Method for Determination of Lead by Inductivety Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absortion (GFAAS) Techniques
ASTM E 1727	(1999) Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques
ASTM E 1729	(1999) Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques
ASTM E 1792	(1996a) Wipe Sampling Materials for Lead in Surface Dust

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (1999) Methods of Fire Tests for Flame-Resistant Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 84-100 (1984; Supple 1985, 1987, 1988 & 1990) NIOSH Manual of Analytical Methods

# U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

# U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD 6780 (1995; Errata Aug 1996; Rev Ch. 7 - 1997)
Guidelines for the Evaluation and Control

of Lead-Based Paint Hazards in Housing

## U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 747-K-99-001 (1999) Protect Your Family From Lead in Your Home

#### U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

24 CFR 35	Lead-Based Paint Poisioning Prevention in Certain Residential Structures
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures

#### 1.2 DEFINITIONS

- a a. Lead Hazard Control Activity Any construction work where a worker may be occupationally exposed to lead and procedures have to be followed to assure that: 1). Lead inside the lead hazard control area is cleaned up to appropriate levels and 2). Lead dust does not disperse outside the lead hazard control area at unacceptable levels.
  - b. Public/Commercial Building Buildings on real property, including residential real property, generally accessible to the public except target housing, child occupied facilities and industrial buildings. Examples include offices, stores/shopping centers, churches, schools, barracks, hospitals, museums, airports, hotels, convention centers.
  - c. Industrial Building Any building used for industrial purposes where normal operations inside the building may produce lead aerosol that will settle out on inside surfaces.
  - d. Target Housing Residential real property which is housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any one or more children age 6 years or under resides or is expected to reside in such housing for the elderly or persons with disabilities) or any 0 bedroom dwelling.
  - e. Child-occupied Facility Real property which is a building or portion of a building constructed prior to 1978 visited regularly by the same child, 6 years of age or under, on at least two different days, provided that each day's visit lasts at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities include but are not limited to, day-care centers, preschools and kindergarten classrooms.
  - f. Residential Real Property Real property on which there is situated one or more residential dwellings used or occupied, or intended to be used or occupied , in whole or in part, as the home

or residence of one or more persons.

#### 1.3 DESCRIPTION OF WORK

The work covered by this section includes work tasks, on Table 1, "Summary of Work Tasks" at the end of this section, and the precautions specified in this section for the protection of workers, building occupants and the environments. Lead-based paint (LBP) will be encountered during renovation and demolition activities on the housing units. Previous testing on a limited number of the housing units has indicated that LBP is present on some of the components which may be impacted by the renovation and demolition activities. The contractor shall remove lead-based paint from components (when these will be impacted) or the entire component with lead-based paint intact during the renovation or demolition activities. Testing verified that LBP was utilized on the following components at some of the units.

#### Interior:

Ceiling Header Trim (Wood) - Living Room, Entry Closet Shelves (Wood) - Main Hall, Bedrooms Baseboard (Wood) - Utility Closet

#### Exterior:

Awning Support Column (Metal)
Awning Support Beam (Metal) - covered with aluminum siding
Awning Facsia (Metal) - covered with aluminum siding
Roof Facsia (Metal) - covered with aluminum siding
Privacy Wall (Wood)
Shed Facsia (Metal) - covered with aluminum siding

# 1.3.1 Protection of Existing Areas To Remain

All project work including, but not limited to, lead hazard work, storage, transportation, and disposal shall be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, the Contractor shall restore work and areas to the original condition at no additional cost to the Government.

## 1.3.2 Coordination with Other Work

The contractor shall coordinate lead hazard control activities with work being performed in adjacent areas. Coordination procedures shall be explained in the Contractor's Accident Prevention Plan and shall describe how the Contractor will prevent lead exposure to other contractors and/or Government personnel performing work unrelated to lead hazard control activities.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials and Equipment;
Expendable Supplies;

A description of the materials, equipment and expendable supplies required; including Material Safety Data Sheets (MSDSs) for material brought onsite to perform the work.

Qualifications; G, AE

A report providing evidence of qualifications and designating responsibilities for personnel and laboratories.

SD-06 Test Reports

Pressure Differential Log; Licences, Permits, and Notifications; G, AE Accident Prevention Plan (APP); G, AE

A report describing how the Contractor will protect workers, building occupants, and building contents while performing lead hazard control activities; and how project clearance will be performed.

Sampling and Analysis; G, AE

A log of the analytical results required for the sampling. The log shall be kept current.

Clearance Report; G, AE

Report prepared by the QSHP.

#### 1.5 OUALIFICATIONS

# 1.5.1 Qualifications and Organization Report

The Contractor shall furnish a qualification and organization report. The report shall describe the qualifications of the qualified safety and health professional (QSHP), onsite safety and health supervisor (OSHS), labor staff and the independent risk assessor. The report shall include an organization chart showing the Contractor's personnel by name and title and project specific responsibilities and authorities. The report shall describe the qualifications of the laboratories selected for this project. The report shall be signed by the Contractor and the qualified safety and health professional to indicate that all personnel and laboratories comply with certification and experience requirements of this section and that project personnel have been given the authority to complete the tasks assigned to them.

#### 1.5.2 Personnel and Subcontractor Responsibilities and Qualifications

#### 1.5.2.1 Qualified Safety and Health Professional (QSHP)

The QSHP shall be responsible for development of project specific requirements in the Accident Prevention Plan (APP); supervise implementation of the APP requirements; visit the site as needed to verify effectiveness of the APP and to coordinate resolution of unknown situations that may develop as the work progresses; be available to provide consultation to the Onsite Safety and Health Supervisor (OSHS); review sampling and analytical results to evaluate occupational exposure levels, verify effectiveness of controls and determine if clearance requirements

have been met. The QSHP shall have demonstrable experience with the implementation of occupational safety and health regulations.

#### 1.5.2.2 Lead Hazard Control Workers

Lead Hazard Control workers shall be responsible for performing the labor necessary to complete the lead hazard control activities required in this contract.

## 1.5.2.3 Independent Certified Risk Assessor

The independent Certified Risk Assessor shall be a subcontractor to the prime Contractor on the project. The risk assessor shall be responsible to perform the sampling and evaluating the analytical data to verify clearance levels have been achieved. The independent risk assessor shall sign the clearance report indicating clearance requirements for the contract have been met.

## 1.5.2.4 Testing Laboratories

The laboratory selected to perform analysis on paint chip, soil or dust wipe samples shall be accredited by EPA's National Lead Laboratory Accreditation Program (NLLAP). The laboratory selected to perform analysis on worker exposure (industrial hygiene) samples shall be in the American Industrial Hygiene Association's Industrial Hygiene Laboratory Accreditation Program (IHLAP) and shall be successfully participating in the Proficiency Analytical Testing (PAT) program for lead.

#### 1.5.2.5 Blood Lead Testing

The laboratory selected to perform analysis on worker blood samples shall be approved by OSHA and meet the requirements contained in http://www.osha-slc.gov/OCIS/toc\_bloodlead.html.

## 1.5.2.6 Disposal Facility and Transporter

The Contractor shall furnish written evidence that the landfill to be used is approved for lead disposal by USEPA, State of Missouri, and local requirements. Copies of any required signed agreements between the Contractor (including subcontractors and transporters) and the lead disposal facility shall be provided.

#### 1.6 REGULATORY REQUIREMENTS

In addition to the detailed requirements of this specification, work shall be performed in accordance with requirements of EM 385-1-1 and applicable regulations including, but not limited to 29 CFR 1910, 29 CFR 1926, especially Section .62, and the accepted Accident Prevention Plan with Appendices. Matters of interpretation of the standards shall be resolved to the satisfaction of and with the concurrence of, the Contracting Officer before starting work. Where these requirements vary, the most stringent shall apply. The following State statutes, regulations and requirements apply to lead hazard control activities to be performed:

Missouri Department of Health 19 CSR 30-70.110 through 19 CSR 30-70.640

## 1.7 ACCIDENT PREVENTION PLAN (APP)

#### 1.7.1 APP Content and Organization

The Contractor's Accident Prevention Plan shall be organized into 5 parts, consisting of the overall plan and 4 appendices. The overall plan shall address each element in Appendix A of EM 385-1-1 in project specific detail. The elements are: a. Signature Sheet, b. Background Information, c. Statement of Safety and Health Policy, d. Responsibilities and Lines of Authorities, e. Subcontractors and Suppliers, f. Training, g. Safety and Health Inspections, h. Safety and Health Expectations, Incentive Programs and Compliance, i. Accident Reporting, j. Medical Support, k. Corporate Plans and Programs required by this contract, (HAZCOM, Respiratory Protection).

#### 1.7.1.1 Lead Hazard Control Plan Appendix

The Lead Hazard Control Appendix shall address occupational exposure issues and shall describe the procedures to be followed to protect employees from lead hazards while performing lead hazard control activities. Each of the following elements shall be addressed in the lead hazard control appendix:

- a. The location and a brief description of each work activity that will emit lead into the workplace atmosphere. A description of any components containing lead shall be included and keyed to the project drawings.
- b. Description of equipment and materials, controls, crew size, worker responsibilities, and operating and maintenance procedures.
- c. Description and sketch of the Lead Hazard Control Areas, including decontamination areas.
- d. Description of the specific lead control methods and procedures to protect workers and other onsite contractors from lead exposure.
- e. Technologic equipment used to keep occupational exposure below the Permissible Exposure Limit and minimize worker exposure to lead (i.e., HEPA-filtered vacuum equipment/cleaners, special negative air enclosure equipment and supplies, etc.).
- f. Worker Exposure Assessment including methods and procedures to monitor and document worker exposure to lead. Worker exposure monitoring shall be broken into two parts in the plan. Part A: Initial Determination. The Contractor shall describe worker monitoring (if performed for the "initial determination" described in 29 CFR 1926 (.62) (d). Monitoring for the initial determination may be omitted from the plan if the Contractor has sufficient proof from previous operations as specified in 29 CFR 1926 (.62) (d)(3)(iii) and (iv) that workers will not be exposed over the action level. The Contractor shall substitute objective proof of action level compliance in Part A if "initial determination" monitoring is omitted. Part B: Continued Exposure Monitoring. Worker exposure monitoring after the initial lead exposure determination has been made.
- g. Work Practices Program describing the protective clothing to be used to protect workers from lead exposure, house keeping procedures employed to minimize spread on lead contamination in the lead hazard control area, hygiene facilities and practices used to prevent workers from inadvertent ingestion of lead.

- h. Administrative Control Procedures, to be used as a last resort, to limit worker exposure to lead. The worker rotation schedule to be employed, should engineering or personal protective equipment precautions fail to be effective, shall be described. This element of the plan shall be omitted if administrative controls will not be used.
- i. Medical Surveillance practices and procedures used to monitor worker exposure to lead and to assure fitness for wearing respiratory protection devices.
- j. Worker training meeting the requirements of 29 CFR 1926 Sections (.62) and (.59) to assure workers understand hazard associated with working with lead and how to protect themselves.
- k. Security: Security shall be established for each lead hazard control area. Entry into lead hazard control areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Persons entering control areas shall be trained, medically evaluated, and equipped with personal protective equipment required for the specific control area to be entered.

#### 1.7.1.2 Activity Hazard Analyses Appendix

An Activity Hazard Analysis (AHA) shall be prepared for each work task data element specified on the individual work task data element sheets at the end of this section. The AHA shall be submitted to the Contracting Officer prior to beginning specified work. Format shall be in accordance with EM 385-1-1, figure 1-1. The AHA shall be continuously reviewed and modified, when appropriate, to address changing conditions or operations. Each accepted AHA shall be appended to and become part of the APP.

## 1.7.1.3 Occupant/Building Protection Plan Appendix

The Contractor shall develop and implement an Occupant/Building Protection Plan describing the measures and management procedures to be taken during lead hazard control activities to protect the building occupants/building facilities (and future building occupants/facilities) from exposure to any lead contamination while lead hazard control activities are performed.

## 1.7.1.4 Clearance Plan Appendix

The Contractor shall develop a Clearance Plan describing practices and procedures used to assure that lead hazard control activities are complete and that lead contamination within the lead hazard control area comply with final clearance levels or visual clearance criteria. Sampling and analysis procedures used to document project completion and clearance goals shall be explained in the Clearance Plan Appendix.

# 1.7.2 Lead Hazard Information Pamphlet Distribution

Prior to commencing lead hazard control activities, the Contractor shall provide owners/occupants who are affected by the project as defined in 40 CFR 745. Subpart E, the EPA 747-K-99-001. The pamphlet shall be provided in compliance with 40 CFR 745 (.80) through 40 CFR 745 (.88). The Contractor shall collect signatures from affected residents acknowledging they have been informed of planned lead hazard control activities.

#### 1.8 PRE-CONSTRUCTION SAFETY CONFERENCE

## 1.8.1 Conference General Requirements

The Contractor and the QSHP shall attend a pre-construction safety conference prior to starting work. Items required to be submitted shall be reviewed for completeness, and where specified, for acceptance. Details of the APP shall be revised to correct any deficiencies, and resubmitted for acceptance. Onsite work shall not begin until the APP has been accepted, unless otherwise authorized by the Contracting Officer. One copy of the APP shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to personnel on the site. As work proceeds, the APP shall be adapted to new situations and conditions. Changes to the APP shall be made by the QSHP with acceptance by the Contracting Officer. Should an unforeseen hazard become evident during performance of the work, the QSHP shall inform the Contracting Officer, both verbally and in writing, for immediate resolution. In the interim, the QSHP shall take necessary action to re-establish and maintain safe working conditions; and to safeguard onsite personnel, visitors, the public, and the environment. Disregard for provisions of this specification, or the accepted APP, shall be cause for stopping of work until the matter is rectified.

#### 1.8.2 Preparatory Inspection Meeting

The Contractor shall arrange and hold a preparatory inspection meeting to review completeness and adequacy of the APP immediately prior to beginning each phase of work.

## 1.9 MEDICAL SURVEILLANCE REQUIREMENTS

The Contractor shall comply with the following medical surveillance requirements:

- a. The Contractor shall make every attempt to keep occupational exposure to lead on this project below the action level of 30 micrograms/cubic meter defined in 29 CFR 1926 (.62). If it is not possible, and if occupational exposures could possibly exceed the action level for 30 or more days per year, the Contractor shall institute a medical surveillance program. The program shall meet the examination frequency and content requirements specified in paragraph (j)(1), (j)(2) and (j)(3) of 29 CFR 1926 (.62). Medical removal as specified in paragraph (k) of 29 CFR 1926 (.62), if necessary, shall be at the Contractor's expense.
- b. Medical surveillance and biological monitoring shall be in compliance with 29 CFR 1926 (.62) (g) and (j). Initial biological monitoring shall be performed on lead hazard control workers prior to assignment to the project. Workers shall not be assigned to the project if results indicate a need for restricted activities.
- c. All lead hazard control workers shall pass the medical examinations necessary to be approved by the occupational physician to wear respiratory protection on this project. Occupational physician's approval shall be given prior to assignment to the project.

## 1.10 RESPIRATORY PROTECTION PROGRAM

The Contractor shall have a written respiratory protection program and shall be fully capable of implementing the requirement of the respiratory protection program on this project. The respiratory protection program shall meet the requirements of 29 CFR 1926 (.62) and 29 CFR 1910 (.134). Project specific respiratory protection requirements shall be included in the lead hazard control plan appendix of the Contractor's accident prevention plan.

#### 1.11 LICENCES, PERMITS AND NOTIFICATIONS

The Contractor shall certify in writing to the state agency responsible for lead hazard activities and the Contracting Officer at least 10 days prior to the commencement of work that licenses, permits and notifications have been obtained. The Contractor is responsible for all associated fees or costs incurred in obtaining the licenses, permits and notifications.

#### 1.12 TRAINING

#### 1.12.1 OSHA Training Requirements

All Contractor personnel and/or subcontractors performing or responsible for onsite oversight of lead hazard control activities shall meet the following training requirements.

- a. Content of 29 CFR 1926 (.62) and its appendices.
- b. How operations could result in exposure over the action level.
- c. Purpose, selection, fitting, use and limitations of respirators.
- d. Purpose and description of the medical surveillance program.
- e. Use of engineering controls and good work practices to limit occupational exposure to lead.
- f. Implementation of the lead hazard control plan appendix of the accident prevention plan.
- g. Medical supervision for the use of chelating agents.
- h. Employee right of access to medical surveillance records as specified in 29 CFR 1910 (.20).

## 1.12.2 Qualified Safety and Health Professional

The qualified safety and health professional shall meet the training requirements in paragraph 1.12.1 and shall meet the training, experience and authority requirements in 29 CFR 1926 (.62) to be a competent person and be trained and have the experience and education to meet 40 CFR 745 Subpart L requirements to carry the following certifications:

- a. Certified Risk Assessor
- b. Certified Project Designer
- c. Certified Supervisor

# 1.12.3 Independent Risk Assessor

The independent risk assessor shall meet the training requirements in paragraph OSHA Training Requirements, above, and shall meet the training

and experience requirements in 40 CFR 745 to carry certification as a certified risk assessor.

#### 1.12.4 Abatement Worker

Workers shall meet the OSHA Training Requirements specified above and the training requirements in 40 CFR 745 Subpart L to carry certification as a Certified Worker, if required.

## 1.12.5 Training Program Certification

Training to meet 40 CFR 745 Subpart L requirements shall be provided by an EPA accredited training provider and the Contractor shall provide proof in the Qualifications and Organization Report showing that personnel have passed certification examinations for their respective disciplines, that fees for certification have been paid to the EPA (or to the state for state-run programs) and that EPA has certified the QSHP, independent risk assessor, certified workers to perform their duties.

#### 1.13 SAMPLING AND ANALYSIS

- 1.13.1 Sampling and Analytical Procedures
- 1.13.1.1 Sampling and Analysis Methods

Analysis shall conform to NIOSH Pub No. 84-100 Method 7082, Lead, for personal sampling required by 29 CFR 1926 (.62). Sampling shall conform to ASTM E 1553.

1.13.1.2 Paint Chip Sampling and Analysis

Sampling shall conform to ASTM E 1729. Analysis shall conform to ASTM E 1613.

1.13.1.3 Dust Wipe Materials, Sampling and Analysis

Sampling shall conform to ASTM E 1792. Analysis shall conform to ASTM E 1613.

1.13.1.4 Soil Sampling and Analysis

Sampling shall conform to ASTM E 1727. Analysis shall conform to ASTM E 1613.

1.13.2 Occupational Exposure Assessment

Sampling and analytical procedures to determine compliance with the occupational exposure monitoring requirement of this section shall be described in the lead hazard control plan appendix of the Contractor's accident prevention plan. Monitoring for the initial determination may be omitted if the Contractor has sufficient proof from previous operations as specified in 29 CFR 1926 (.62) (d)(3)(iii) and (iv) that workers will not be exposed over the action level. The following occupational exposure monitoring requirements apply and shall be implemented if the requirements of 29 CFR 1926 (.62)(d)(3) (iii) and (iv) cannot be demonstrated.

a. During Initial Monitoring the Contractor shall representatively sample employees with the greatest potential for exposure to aerosolized lead.

b. Continued/Additional Monitoring shall meet applicable paragraphs in 29 CFR 1926 (.62)(d)(6), Frequency, after the initial determination has been made.

## 1.13.3 Lead Hazard Control Area/Containment Monitoring

The Contractor shall perform a visual inspection once per day outside the lead hazard control area to assure visual clearance criteria are maintained while lead hazard control activities are performed. The Contractor shall clean at its own expense, and to the Contracting Officer's satisfaction, all contaminated surfaces outside the lead hazard control area, if surfaces fail visual clearance criteria.

#### 1.13.4 Occupancy During Work

The Contractor shall wipe sample a floor surface at a location no more than 3 m outside the lead hazard control area at a frequency of once per day while lead hazard control activities are being performed. Wipe sampling analytical results shall pass clearance criteria for floors specified in this contract. The Contractor shall clean all contaminated surfaces at its own expense and to the Contracting Officer's satisfaction, if floor wipe samples required in this paragraph fail clearance criteria.

#### 1.13.5 Clearance Monitoring

Sampling and analytical procedures to determine the clearance requirements of this section shall be described by the Contractor in the Clearance Plan Appendix of the Accident Prevention Plan. The Contractor shall perform the following sampling and analysis to verify that clearance requirements for the contract (inside the lead hazard control) area have been met.

- a. The Contractor shall take dust wipe samples inside the lead hazard control area after the final visual inspection in the quantities and at the locations specified. Dust wipe samples collected for clearance purposes shall be taken a minimum of 1 hour after completion of final post-abatement cleaning activities.
  - (1) Floors 1 per room for no less than 4 rooms, hallways or stairwells inside the containment. If there are less than 4 rooms, hallways or stairwells within the containment, then all rooms, hallways or stairwells shall be sampled. In addition, 1 sample shall be taken from the floor outside of the containment area.
  - (2) Interior Window Sills (if available) 1 per room for no less than 4 rooms, hallways or stairwells inside the containment. If there are less than 4 rooms, hallways or stairwells within the containment, then all rooms, hallways or stairwells shall be sampled.
- b. The Contractor shall perform the final visual inspection inside the lead hazard control area after an exterior abatement. All horizontal surfaces in the outdoor living area closest to the abated surface shall be inspected and found to be free of visible dust and debris. In addition, a visual inspection shall be performed on areas below the abated surface. If paint chips are present, they must be removed for the site and properly disposed of, according to applicable Federal, State, and local

requirements.

## 1.13.6 Waste Disposal Sampling

The Contractor shall sample, as necessary, the waste streams generated during lead hazard control activities for TCLP analysis to determine waste disposal requirements.

## 1.13.7 Analytical Results

The Contractor shall develop and maintain during the course of the project a log of analytical results generated by the above sampling requirements. The log shall clearly describe the reason for which the sample was taken (worker exposure, migration control, clearance) the analytical result for each sample and evaluate if the analytical result passed or failed the action levels. At a minimum, the Contractor shall include analytical results for samples required to be taken in paragraphs Occupational Exposure Assessment, Lead Hazard Control Area/Containment Monitoring, Occupancy During Work, and Clearance Monitoring specified above.

#### 1.14 CLEARANCE REQUIREMENTS

The Contractor shall describe clearance requirements for this project in the Clearance Plan Appendix of the Accident Prevention Plan.

- a. Clearance levels inside the lead hazard control area, target housing and child occupied facilities, active installations:
  - (1) Floors 40 micrograms per square foot.
  - (2) Interior Window Sills 250 micrograms per square foot.

## 1.15 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The Contractor shall describe the PPE to be used to protect workers from lead hazards in the Lead Hazard Control Plan Appendix of the Accident Prevention Plan. The Contractor shall furnish, at no cost to the workers, clothing for protection from lead-contaminated dust and debris. An adequate supply of these items shall be available for worker and Government personnel use. Protective clothing shall include:

- a. Coveralls: Full-body breathable disposable coveralls shall be provided to lead hazard control workers.
- b. Boots: Boots and shoes shall be provided as required by EM 385-1-1 Section 05.A.08 for workers. Boot/shoe covers shall be provided to prevent contamination of boots and shoes.
- c. Hand Protection: Gloves, etc., shall be provided as required by EM 385-1-1 Section 05.A.10 for workers.
- d. Head Protection: Hard hats shall be provided as required by 29 CFR 1910 (.135) and EM 385-1-1 Section 05.D for workers and authorized visitors.
- e e. Eye and Face Protection: Eye and face protection shall be provided as required by 29 CFR 1910 (.133) and EM 385-1-1 Section 05.B for workers and authorized visitors.
  - f. Respirators: NIOSH certified air-purifying respirators or

filtering face pieces shall be provided for use as respiratory protection for airborne lead and for other hazardous airborne contaminants that may be encountered; as determine by the on-site safety and health supervisor. At a minimum, respirators shall be furnished to each employee required to enter a lead hazard control area where an employee exposure assessment has not yet been performed, or where monitoring data establishes the need for respiratory protection, or if requested by the employee.

g. Respirator Cartridges/Filtering Face Pieces: Respirator cartridges shall be changed out/filtering face pieces properly disposed of when the they become sufficiently loaded with particulate matter that workers experience breathing resistance. Cartridges and filtering face pieces shall be N, R or P 100 rated to assure sufficient protection from lead exposure.

#### 1.16 HYGIENE FACILITIES

The Contractor shall describe the personal hygiene facilities to be used by the workers in the Lead Hazard Control Plan Appendix of the Accident Prevention Plan. The Contractor shall provide hygiene facilities for lead hazard control workers. Hygiene facilities shall consist of the following:

#### 1.16.1 Hand Wash Stations

The Contractor shall provide hand washing facilities for use by lead hazard control workers. Hand washing facilities shall comply with the requirements in 29 CFR 1926 (.51) (f). Faces and hands shall be washed when leaving the lead hazard control area and after each work-shift if showers are not provided.

## 1.16.2 Change Area

The Contractor shall provide a change area to workers. The change area shall be equipped so that contaminated work clothing and street clothes shall be stored separately to prevent cross contamination.

#### 1.16.3 Showers

Showers shall be provided if feasible and if worker exposures exceed the PEL. When provided, showers facilities shall meet the requirements of 29 CFR 1926 (.51) (f).

# 1.16.4 Eating Area

The Contractor shall set aside an area or provide a room for taking breaks and eating lunch. This area shall be kept as free as practicable from lead contamination. Workers shall be required to follow the procedures in 29 CFR 1926 (.62) (i) (4) when using the room.

#### 1.17 POSTED WARNINGS AND NOTICES

The following regulations, warnings, and notices shall be posted at the worksite in accordance with 29 CFR 1926 (.62).

#### 1.17.1 Regulations

At least two copies of 29 CFR 1926 (.62) shall be made available for use by either the Contracting Officer or affected workers; and for the purpose of

providing required information and training to the workers involved in the project. One copy shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to workers on the site.

#### 1.17.2 Warning Signs and Labels

Warning signs shall be posted in each lead hazard control area where worker exposure to lead is undetermined or where the exposures are above the permissible exposure limit as defined in 29 CFR 1926 (.62). Signs shall be located to allow personnel to read the signs and take necessary precautions before entering the lead hazard control area.

#### 1.17.2.1 Warning Signs

Warning signs shall be in English, be of sufficient size to be clearly legible, and display the following:

WARNING LEAD WORK AREA POISON NO SMOKING OR EATING

#### 1.17.2.2 Warning Labels

Warning labels shall be affixed to all lead waste disposal containers used to hold materials, debris and other products contaminated with lead hazards; warning labels shall be in English, and be of sufficient size to be clearly legible, and display the following:

CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY

BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN

ACCORDANCE WITH APPLICABLE FEDERAL, STATE OR LOCAL REGULATIONS.

## 1.17.3 Worker Information

Right-to-know notices shall be placed in clearly visible areas accessible to personnel on the site, to comply with Federal, state, and local regulations.

#### 1.17.4 Air Monitoring Results

Air monitoring results shall be prepared so as to be easily understood by the workers. One copy shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to the workers as specified in 29 CFR 1926 (.62).

#### 1.17.5 Emergency Telephone Numbers

A list of emergency telephone numbers shall be posted at the site. The list shall include numbers of the local hospital, emergency squad, police and fire departments, Government and Contractor representatives who can be reached 24 hours per day, and professional consultants directly involved in the project.

## 1.18 MATERIALS AND EQUIPMENT

Sufficient quantities of health and safety materials required by 29 CFR 1926 (.62), and other materials and equipment needed to complete the project, shall be available and kept on the site.

## 1.18.1 Abrasive Removal Equipment

The use of powered machine for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

#### 1.18.2 Vacuum Systems

Vacuum systems shall be suitably sized for the project, and filters shall be capable of trapping and retaining all mono-disperse particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent. Used filters that are being replaced shall be disposed in a proper manner.

## 1.18.3 Heat Blower Guns

Heat blower guns shall be flameless, electrical, paint-softener type with controls to limit temperature to 590 degrees C . Heat blower shall be DI (non-grounded) 120 volts ac, and shall be equipped with cone, fan, glass protector and spoon reflector nozzles.

## 1.18.4 Chemical Paint Strippers

Chemical paint strippers shall not contain methylene chloride and shall be formulated to prevent stain, discoloration, or raising of the substrate materials.

# 1.18.5 Chemical Paint Stripper Neutralizer

Neutralizers for paint strippers shall be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

## 1.18.6 Detergents and Cleaners

Detergents or cleaning agents used shall have demonstrated effectiveness in lead control work using cleaning techniques specified by HUD 6780 quidelines.

#### 1.19 EXPENDABLE SUPPLIES

### 1.19.1 Polyethylene Bags

Disposable bags shall be polyethylene plastic and shall be a minimum of 0.15 mm thick (0.1 mm thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be capable of being made leak-tight. Leak-tight means that solids, liquids or dust cannot escape or spill out.

## 1.19.2 Polyethylene Leak-tight Wrapping

Wrapping used to wrap lead contaminated debris shall be polyethylene plastic that is a minimum of 0.15 mm thick or any other thick plastic material shown to demonstrate at least equivalent performance.

#### 1.19.3 Polyethylene Sheeting

Sheeting shall be polyethylene plastic with a minimum thickness of 0.15 mm, or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, flame-resistant polyethylene sheets which conform to the requirements of NFPA 701 shall be provided.

#### 1.19.4 Tape and Adhesive Spray

Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water. Tape shall be minimum 50 mm wide, industrial strength.

#### 1.19.5 Containers

When used, containers shall be leak-tight and shall be labeled in accordance with EPA, DOT and OSHA standards, as specified in paragraph WARNING LABELS.

#### 1.19.6 Chemicals

Chemicals, including caustics and paint strippers, shall be properly labeled, used in accordance with the manufacturers recommendations and stored in leak-tight containers. Material Safety Data Sheets (MSDSs) shall be provided and hazard communication procedures implemented in conformance with paragraph HAZARD COMMUNICATION PROGRAM.

#### 1.20 STORAGE OF MATERIALS

Materials shall be stored protected from damage and contamination. During periods of cold weather, plastic materials shall be protected from the cold. Flammable or hazardous materials shall not be stored inside a building. Materials shall be regularly inspected to identify damaged or deteriorating items. Damaged or deteriorated items shall not be used and shall be removed from the site as soon as they are discovered. Stored materials shall not present a hazard or an inconvenience to workers, visitors, and/or other occupants and employees of the facility in which they are located.

#### PART 2 PRODUCTS (NOT APPLICABLE)

#### PART 3 EXECUTION

#### 3.1 WORK PROCEDURES

The Contractor shall perform work following practices and procedures described accident prevention plan.

## 3.1.1 Lead Hazard Control Areas, Equipment and Procedures

The Contractor shall set up lead hazard control areas and operate equipment within the lead hazard control area in a manner that will minimize migration of lead dust beyond the lead hazard control area boundaries and minimize exposure to workers.

#### 3.1.2 Lead Hazard Control Areas

Access into lead hazard control areas by the general public shall be prohibited. Workers entering the lead hazard control area shall meet medical surveillance requirements of this contract and shall be required to understand and follow procedures described in the Contractor's accident prevention plan for reducing lead exposure. Lead hazard control area preparation and restriction requirements follow:

- a. Containment features for interior lead hazard control projects:
  Polyethylene sheeting sealed with spray adhesive and duct tape to
  designate the lead hazard control area. The floor in the lead
  hazard control area shall be covered with two layers of
  polyethylene sheeting. Openings, such as HVAC supply and return
  air vents, into the lead hazard control area shall be sealed with
  polyethylene sheeting and duct tape or with sealed rigid coverings.
- b. Containment features for exterior lead hazard control projects:
  Polyethylene sheeting extending a minimum of 10 feet from the
  working surface, plus another 5 feet for each additional 10 feet
  in surface height above 20 feet, from the perimeter of the working
  surfaces. The polyethylene sheeting shall: be securely attached
  to the building and cover all ground plants or shrubs in the
  working area; protected from perforating and tearing; contain any
  water which may accumulate during abatement; and be weighted down
  to prevent disruption from wind. A roped-off boundary perimeter,
  using caution tape or a barrier installed at a minimun of 20 feet
  distance (if feasible) from where the lead control work is
  performed. All windows within the regulated area or within 20
  feet of the working surface shall be closed.

## 3.2 USE OF HYGIENE FACILITIES

- a. Personnel and equipment shall be decontaminated when exiting the lead hazard control area. The Contractor shall comply with the following personnel and equipment decontamination procedures:
  - (1) HEPA vacuum outer garments and equipment.
  - (2) Wet Wipe Equipment.
  - (3) Remover outer layer of garments.
  - (4) Thoroughly wash face and hands, if showering not required.
  - (5) Shower (if applicable).
  - (6) Remove Respirator (if applicable).
  - (7) Exit lead hazard control area.
- b. The Contractor shall provide, and workers shall use, a change room to change into work clothing at the beginning of a work shift. At the end of the work shift workers shall change back into street clothing and leave contaminated work clothing at the site for disposal or laundering.
- c. The Contractor shall provide an eating facility as free as practical from lead contamination. Workers shall be allowed usage of the eating facility for rest/lunch breaks.

#### 3.3 FURNISHINGS

The Contractor shall remove furniture and equipment, if present, from the work area before lead hazard control work begins.

## 3.4 WASTE DISPOSAL PROCEDURES

# 3.4.1 Construction Debris and/or Sanitary Landfill Waste

The Contractor shall dispose of the following waste streams in a sanitary landfill: Building Construction Debris

#### 3.4.2 Waste Stream Classification

The Contractor shall determine the RCRA waste classification for all waste streams generated by the lead hazard control project. The Contractor shall perform the sampling and analysis specified in paragraph WASTE DISPOSAL, evaluate analytical results and propose waste stream treatment and disposal requirements for the contract. The Contracting Officer will approve waste stream treatment and disposal requirements proposed by the Contractor.

#### 3.4.3 RCRA Subtitle C Hazardous Waste

The Contractor shall dispose of waste streams classified as hazardous at the RCRA subtitle C Treatment Storage and Disposal Facility or at the RCRA subtitle C hazardous wastes landfill.

# 3.4.4 Hazardous Waste Transportation and Disposal

The Contractor shall be responsible for the transport and disposal of hazardous waste.

# 3.5 LEAD HAZARD CONTROL PROCEDURES, METHODS AND TECHNIQUES.

## 3.5.1 Interior Baseboards, Ceiling Trim, Closet Shelving

Prepare areas where the baseboard, ceiling trim and closet shelving is located as indicated in Paragraph 3.1.2 "Lead Hazard Control Areas", subparagraph a. Lightly mist the component with water for dust control prior to removal (except in areas where electrical circuits are present). Use a utility knife or other sharp instrument to score all affected painted seams to minimize paint chipping and dust generation during removal. Remove screws, nails or other fasteners using a flat pry instrument and hammer, carefully prying the component away from the surface to which it is attached. Remove component intact to minimize paint chip and dust generation. After the component has been removed, carefully remove or bend back nails or other fastening devices and wrap the component with 6-mil polyethylene sheeting and seal with duct tape. Begin cleaning procedures immediately after the component has been removed and sealed using HEPA filtered vacuums and wet cleaning methods. Cleaning of surfaces shall consist of HEPA vacuuming, wet cleaning, and HEPA vacuuming.

# 3.5.2 Exterior Privacy Fence

Prepare areas where the privacy fencing is located as indicated in Paragraph 3.1.2 "Lead Hazard Control Areas", subparagraph b. Lightly mist the component with water for dust control prior to removal. Use a utility knife or other sharp instrument to score all affected painted seams to minimize paint chipping and dust generation during removal. Remove screws, nails or other fasteners using a flat pry instrument and hammer, carefully prying the

component away from the surface to which it is attached. Remove component intact to minimize paint chip and dust generation. After the component has been removed, carefully remove or bend back nails or other fastening devices and wrap the component with 6-mil polyethylene sheeting and seal with duct tape. Begin cleaning procedures immediately after the component has been removed and sealed using HEPA filtered vacuums and wet cleaning methods. Cleaning of surfaces shall consist of HEPA vacuuming, wet cleaning, and HEPA vacuuming.

# 3.5.3 Other Lead-Based Paint Components

Should renovation or demolition activities impact other components or surfaces identified as lead-based paint, the contractor shall follow the requirements of this specification and the OSHA CFR 1926.62 Construction Standard.

## 3.5.4 Paint Removal Methods

Prohibited paint removal methods shall include: open flame burning or torching, including the use of heat guns having operating temperatures greater than 590 degrees C; machine sanding or grinding without HEPA exhaust; non-contained hydro blasting or high-pressure water wash; abrasive blasting or sandblasting without HEPA exhaust; dry scraping, except near electrical outlets or when using a heat gun. Chemical paint removers containing methylene chloride are prohibited. Building components and structures adjacent to the removal process shall be appropriately protected from damage due to the removal process employed. Stripping shall be done according to manufacturer's recommendations. Stripped substrates shall be thoroughly washed and neutralized before applying a primer or sealing coat.

# 3.5.4.1 Low Temperature Heat Gun

Prior to beginning work, electrical fuses and adequate electrical supply shall be verified. Only fuses properly sized for the service, and otherwise permitted by code, shall be used. Properly sized fuses shall not be changed out with larger fuses to increase amperage beyond safe limits. Portable electric generators may be used to safely supply adequate amperage. An accessible garden hose with a pressure-release spray nozzle; a crowbar to remove smoldering wood; and a long-handled sledgehammer to open up walls exposed to smoldering insulation shall be readily available. A fully charged ABC-type (89 N minimum) fire extinguisher shall be available within 30 m of the work area. Adequate ventilation shall be provided for the work area. Worker protection shall include respirators equipped with combination HEPA filter/organic vapor cartridges. The Contractor shall equip heat guns with extension tubes or wire mesh as needed to prevent premature burnout of the heating elements and to minimize paint film scorching or smoking. Optimal heat gun/substrate separation is typically 75 to 150 mm .

### 3.5.4.2 HEPA Sanding

The HEPA vacuum shall be correctly sized to provide adequate airflow, permitting the system to operate properly. If longer exhaust hoses are used, a larger HEPA vacuum shall be provided to handle the extra pressure drop in the vacuum hose. The HEPA filter shall be operated in accordance with manufacturer's instructions. Worker protection shall include respirators or filtering facepieces equipped with HEPA filters.

## 3.5.4.3 Wet Scraping

Surfaces near electrical outlets shall not be moistened but shall be dry scraped only. Loose material shall be scraped from the surface and deposited onto the containment plastic. Damp scrapings shall be cleaned up as soon as possible to prevent tracking throughout the work area. Scraper blades shall be kept sharp. Additional scraper blades shall be supplied and shall be selected for the type of surface being scraped.

## 3.5.4.5 HEPA Vacuum Needle Gun

The vacuum needle gun head shall be equipped with a vacuum shroud designed for the surface to be treated. The needle gun shall be operated to maximize surface contact of the vacuum shroud. Work shall be positioned to minimize the degree workers must reach above shoulder level, in order to minimize worker fatigue and loss of needle gun contact with the surface.

#### 3.5.4.6 Onsite Paint Removal

Paint remover shall be applied in accordance with the manufacturer's instructions. Outdoor application shall only be performed in weather conditions recommended by the manufacturer. The work area surrounding the application process shall be secured to prevent access by children and unauthorized personnel. Workers shall be provided with the appropriate personal protective clothing and equipment in accordance with manufacturer's recommendations and good industrial hygiene practice. A portable eyewash shall be provided whenever eye irritant strippers are used. An abundant source of running water shall be provided in the work area. The stripper shall be tested in a small area prior to full scale stripping. Caustic strippers shall not be used on aluminum or glass surfaces. Waste disposal shall be in accordance with paragraph WASTE DISPOSAL PROCEDURES. Stripped surfaces shall be neutralized and washed in accordance with manufacturer's instructions and paragraph CHEMICAL PAINT STRIPPER NEUTRALIZER. Stripped surfaces shall be completely dry before repainting, and shall be repainted only with paints proven compatible with the stripping techniques employed.

# 3.6 CLEARANCE PROCEDURES

## 3.6.1 Visual Inspection

QSHP shall perform a visual inspection, using the form at the end of this section, for each lead hazard control area to assure that lead hazard control activities, identified in the individual work task data elements, have been properly completed. The QSHP shall visually verify that lead hazards have been removed, control technology has been appropriately applied/installed and that the lead hazard control area is free of dust and paint chips generated by lead hazard control activities.

# 3.6.2 Analytical Demonstration of Clearance

After the visual inspection the QSHP shall take clearance samples for laboratory analysis to verify clearance requirements specified in paragraph CLEARANCE REQUIREMENTS have been met.

# 3.7 EVALUATION OF SAMPLING AND MONITORING RESULTS

Analytical results from samples taken during lead hazard control activities

shall be evaluated to determine compliance with occupational safety and health standards and project specific control efficiency and clearance/clean up levels.

# 3.7.1 Occupational Safety and Health

The QSHP shall review the analytical results from samples taken for the initial exposure assessment and continued occupational safety and health monitoring if required. Effectiveness and adequacy of personal protective equipment, respirators, work practices, hygiene facilities and personal decontamination procedures shall be evaluated and upgrades/downgrades in equipment and procedures made. After notifying the Contracting Officer the following shall be applied:

- a. Exposures over the PEL (0.05 mg/cubic meter):
  - (1) Improve work practices to reduce exposures.
  - (2) Don respirators.
  - (3) Assure eating facilities and change rooms are clean and are free from settled dust.
  - (4) Shower as part of personal decontamination.
- b. Exposures over the Action Level (0.03 mg/cubic meter):
  - (1) Assure exposed individuals enrolled in the medical surveillance program.
  - (2) Assure exposed individuals enrolled in and up to date with lead exposure training requirements.

# 3.7.2 Control Efficiency of Containment Features

The QSHP shall review and document results of the visual inspection determining visual clearance criteria are being met while lead hazard control activities are being performed. The QSHP shall review analytical results from samples taken to determine if lead is migrating outside lead hazard control areas at levels in excess of clearance criteria. The QSHP shall notify the Contracting Officer and apply the following actions if results exceed project specific clearance levels outside the lead hazard control area:

- a. Require/improve containment.
- b. Improve work practices to reduce lead aerosol generation.

#### 3.7.3 Clearance

The QSHP shall review analytical results for the samples taken to determine compliance with project specific clearance requirements. The following actions apply and shall be performed at the Contractor's expense if project specific clearance levels are exceeded:

Reclean surfaces.
Retest to determine clearance.

### 3.7.4 Removal of Lead Hazard Control Area

Upon acceptance of the final clearance certification by the Contracting Officer, and when authorized, cleared Lead Hazard Control Area boundary controls and warning signs shall be removed.

#### 3.8 CLEARANCE REPORT

The QSHP shall prepare a clearance report including the following information:

- a. Start and completion dates of lead hazard control activities.
- b. Type of lead hazard control activity performed (i.e., abatement, interim control, renovation, remodeling), locations and lead hazards controlled or abated.
- c. The name and address of each firm conducting lead hazard control activities and the name of each supervisor assigned to the project.
- d. The Occupant Protection Plan prepared pursuant to paragraph OCCUPANT PROTECTION PLAN.
- e. The name, address and signature of the QSHP or independent risk assessor to indicate clearance requirements have been met.
- f. Certification of each Final Cleaning and Visual Inspection performed by the QSHP.
- g. Analytical results from clearance sampling performed by the QSHP or independent risk assessor, the name of the laboratory that conducted the analysis. Results shall be provided in both the laboratory report and on the appropriate example forms provided at the end of this section.
- h. A detailed written description of the lead hazard control activities performed, including hazard control methods used, locations of rooms and/or components where lead hazard control activities occurred, reason for selecting particular hazard control methods for each component, and any suggested monitoring of encapsulants or enclosures.
- i. Hazardous waste disposal documentation.
- j. Contractor provided installation/maintenance manuals.

# 3.9 TITLE TO MATERIALS

Materials resulting from demolition work, except as specified otherwise, shall be come the property of the Contractor, and shall be disposed of in accordance with Section 02220A DEMOLITION, except as specified.

## 3.10 PAYMENT FOR HAZARDOUS WASTE

Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Government.

### 3.11 CERTIFICATION OF VISUAL INSPECTION

Certify that the lead hazard control ares(s) for each individual work task data elements have passed visual clearance criteria and are ready for clearance sampling. To pass visual clearance, lead hazards have to be removed; control technology appropriately applied/installed; the lead hazard control area must be free from visible dust debris, paint chips or any other residue that may have been generated by the lead hazard control activities.

signature by the QSHP indicates that the area(s) have passed visual clearance cr.	iteria. Provide detailed
description of each Lead Hazard Control	Area.
BY:	
QSHP Date	
Print name and title	
CONTRACTING OFFICER ACCEPTANCE OR REJECT	FION
The Contracting Officer hereby determine visual inspection of the lead hazard continuous, finds the Contractor's work	ntrol area and by quality assurance
Acceptable, ready for performan	nce of clearance sampling
Unacceptable, Contractor instruction area	ucted to re-clean the lead hazard
BY: Contracting Officer's Representation	ve
Signature	Date
Drint name and title	

Lead Hazard Control Clearance Sampling Certification Form
Date
Name of QSHP or Certified Risk Assessor
License No
Work Task Data Element
Clearance Levels 40 CFR 745 Clearance Levels 24 CFR 35 Clearance Levels
Sample quantity and location: Windows Floors Exterior Soils
Date of sample collectionDate Shipped to lab
Shipped by
Signature
I certify that the clearance samples taken meet the clearance sampling requirements of this contract.
By: Date:
QSHP or independent risk assessor
Print name and Title:
CONTRACTING OFFICER ACCEPTANCE OR REJECTION
I have inspected sampling locations and procedures and have found them to be
Acceptable, meet contract requirements.
Unacceptable, do not meet contract requirements, Contractor is directed to resample.
By: Contracting Officer's Representative
Signature Date
Print Name and Title

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Ν
   TABLE 1
   SUMMARY OF WORK TASKS
TASK(1)
 Α
 В
 С
D
LOCATION(2)
A. Interior Closets Throughout
 B. Interior Living Room, Entry
 C. Interior Utility Closets
D. Exterior
DESCRIPTION(3)
 A. Wood Shelving
 B. Wood Ceiling Trim
 C. Wood Baseboard
D. Wood Privacy Wall
LHCA(4)
 Component Removal
QUANTITY(5)
 LINEAR FT.
 A. 0
B. 76.5
 C. 10
 D. 0
 SQUARE FEET
 A. 100
 B. 0
 C. 0
 D. 150
 EACH
A. 0
 B. 0
 C. 0
D. 0
Post LHCA Building/Facility Use(6)
 Target Housing/Child Occupied Active Facility
Clearance Requirements(7)
 A. 40 CFR 745 Dust Sampling
 B. 40 CFR 745 Dust Sampling
 C. 40 CFR 745 Dust Sampling
 D. 40 CFR 745 Visual Only
 NOTES:
(1)
          Work Task Designation
(2)
          Specific location of the work (building, floor, area, etc.)
(3)
         Description of material.
(4)
         Lead Hazard Control Activity (at all task locations).
          Quantity of LBP in Linear Feet (ft); Square Feet (sf); Each
(5)
number of items.
```

- (6) Post Lead Hazard Activity Control Building/Facility Use (at all task locations).
- (7) Clearance Requirements
  - -- End of Section --

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DIVISION 14 - CONVEYING SYSTEMS

THRU

DIVISION 16 - ELECTRICAL

NOT APPLICABLE